Increasing health related physical activity in previously sedentary adults

A comparison of fitness testing and exercise consultation

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Abstract

Regular physical activity has considerable potential to enhance the physical and mental health of the general population. Equally, there is clear evidence from epidemiological studies over the last several decades of the danger of physical inactivity to health. Unfortunately, participation levels in physical activity (defined as day to day general physical activity, exercise or sport) are low with an estimated three quarters of the adult population not taking sufficient physical activity to maintain cardio-respiratory fitness. At a public health level, it is vital that the most sedentary part of the population is encouraged to adopt and maintain increased levels of regular physical activity. A major challenge faces health professionals in the physical activity field in discovering which interventions are effective in particular situations. This research tackles this challenge by comparing the effectiveness of fitness assessment with exercise consultation in increasing physical activity in sedentary adults in a workplace setting.

Three separate studies were carried out in the research. Study one involved sedentary adults who were users of a community centre in North Ayr. The first study enabled the author (main researcher) to look at methodological issues and measurement tools in relation to this type of research. Studies two and three recruited sedentary NHS employees who worked at two hospital sites namely, Ayrshire Central in Irvine and Crosshouse in Kilmarnock. Subjects in studies two and three were middle aged (Study II: Mean 39.4, SD=9.6 yr; Study III: Mean=37.9, SD=10.0yr) and mostly women (Study II: 94% female ; Study III: 74% female). These figures are generally representative of the employee gender and age distribution at each hospital site.

Sedentary subjects were recruited to studies two (N=119) and three (N=179) using an adapted 'stages of change' questionnaire. Respondents who were categorised as 'contemplators' (Study II:18%; Study III:28%) and 'preparers' (Study II:82%; Study III:72%) were invited to take part in these studies. These subjects were randomly assigned to one of three interventions namely, information only, exercise consultation or fitness assessment. They were recalled for post test at six months. The dependent variables were physical activity (PA: $hr.wk^{-1}$) and psychological well-being. An adapted seven day recall physical activity questionnaire was designed to measure PA. Measurements of this variable were also taken at four weeks, and at a three month interval.

In relation to PA in study three, a repeated measures ANOVA found a significant positive main effect for PA over time in all groups, no group or stage of change main effect but a stage of change by time interaction. A follow up comparison of group means showed that PA at four weeks, three months and six months post test were greater than the pre- test measure but there was a borderlne significant drop in PA from three months to six months post test. Planned comparisons did show 'preparers' in the exercise consultation group having a borderline significant positive effect ($p=0.074$) over the fitness assessment group at a four week interval. Similarly, 'preparers' in the exercise consultation group had a significant ($p=0.016$) positive difference in PA from three months to post test over 'preparers' in the fitness assessment group.

In relation to psychological well-being in study three, it was found that coping deficits had significantly improved ($p=0.0003$); the positive change in coping assets however, was of borderline significance ($p=0.056$). Further analysis revealed that change was not determined by stage of change or intervention group. A possible reason for the failure to document differences between the intervention groups may be due to the fact that subjects in this research did not have the benefit of social interaction from an exercise leader or from participation in structured exercise classes.

The research has demonstrated that giving appropriate information to carefully targeted sedentary employees who work in a supportive environment can help increase physical activity levels. At the adoption phase there seems to be no advantage in carrying out a fitness assessment or an exercise consultation. Information giving is most cost effective and one that can be implemented in the many and varied opportunities which exist for health professionals. The general trend, as discerned from the plots of PA over time, showed that any initial positive change dropped markedly in the period between three months to six months post test. Furthermore, the stage of change by time interaction showed, rather surprisingly, that 'contemplators' required relatively less support than 'preparers' in the maintenance phase. No matter what type of intervention takes place, it was clear that on-going support was required to assist individuals maintain any initial positive change.

Exercise consultation is a new approach to helping sedentary individuals increase physical activity levels. This type of intervention was found to be appealing from a subjective level and there was some evidence (from planned comparisons) to suggest that it was more effective than fitness assessment in helping sustain the change in the move from adoption to maintenance. It is important that sedentary individuals who adopt more physically active lifestyles are given further support and a range of

move from adoption to maintenance. It is important that sedentary individuals who adopt more physically active lifestyles are given further support and a range of choices to maintain this behaviour change. Exercise consultation is particularly suited to help individuals in this dynamic process. It is recommended that this form of intervention be replicated with sedentary adults in similar workplaces and other settings to confirm these initial findings.

Subjects (N=72) in the fitness assessment intervention group were analysed separately as this intervention gave data on an additional variable namely aerobic power. The analysis showed that males had improved their aerobic power by 3.4 $ml.kg.min^{-1}$ at post test ($p=0.037$). The corresponding improvement in PA of fifty minutes by these males, failed to show a significant difference ($p=0.17$). Female subjects however did not increase their aerobic fitness level as a result of the intervention. A health related fitness assessment requires relatively costly equipment, trained personnel and takes around an hour to complete. Therefore health professionals who work in the field of physical activity promotion, should re-evaluate the practice of fitness assessment with those who are in the 'contemplator' and 'preparer' stages of change, especially women.

Two questionnaires were developed for the research namely an adapted 'stages of change' and an adapted seven day recall of leisure time physical activity. Both questionnaires may have wide practical use and application in the field of health related physical activity.

This research has shown that for targeted sedentary adults employed in a positive working environment, information giving, fitness assessment and exercise consultation produced positive changes in physical activity over a six month time period. There is little value in undertaking fitness assessment in women who are in the 'contemplator' and 'preparer' stages of change. There is some evidence however to support the view that exercise consultation is useful in helping subjects who have already adopted more active lifestyles to maintain this change.

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Declaration

This thesis is the work of the author (main researcher) and the research assistants under the direct supervision of the author.

Christopher W Loughlan

Publications

The following papers have been published or submitted from work based in the research:

1. Loughlan C, Mutrie N. Conducting an exercise consultation: Guidelines for health professionals. submitted *Journal of the Institute of Health Education*

2. Loughlan C, Mutrie N. Recruitment of sedentary NHS staff for a workplace exercise programme using an adapted 'stages of change' questionnaire *Journal of Sports Science 1995;13(1):63-64*†

3. Loughlan C, Mutrie N, Appraisal of validation criteria for a seven day leisure time physical activity questionnaire Accepted for British Association of Exercise and Sport Sciences' Annual Conference, Belfast 1995

† Note: Journal of Sports Sciences is the official publication of the British Association of Sport and Exercise Sciences

Chapter 1

Introduction and Statement of Problem

1.1 Introduction

The background to the study with respect to the relationships between physical activity, health and well-being is outlined in this section. The low participation rates in physical activity in the Scottish and UK adult population are then described. The range of theoretical models in health behaviour is discussed and the difficulty of changing health related behaviour is underscored. Over recent years, research on the health and functional effects of physical activity has followed two main pathways: the relationship between physical inactivity and disease, notably coronary artery disease and the relation of exercise to functional capacity (1). Within the last fifteen years there has been steady growth in research addressing the complex area surrounding adoption and maintenance of physical activity (2). Other researchers have noted that research of behaviour change in relation to physical activity has been restricted to studies of adults in supervised exercise programmes (3).

The workplace setting provides the context for this study and therefore any attempt to change behaviour must be fully aware of the 'environmental backdrop' which this particular setting provides. The limitations and reservations to the study are then explored. The chapter concludes by setting out the research aims and specific objectives of the three distinct studies which are contained in this thesis.

1.2 Physical Activity and Health

Whilst operational definitions of terms are fully set out at the start of chapter three, it may be helpful to define the two main terms- physical activity and exercise:
"Physical activity is any bodily movement produced by skeletal muscles that results in energy expenditure" (p.127)
"Exercise is planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness" (p.127) (4).

Prevention of disease

The inverse relationship between physical activity and mortality is widely accepted (5-8). Two international conferences have brought together the research evidence from clinical, epidemiological and experimental studies on physical activity and health (9, 10). Both conferences produced consensus statements in support of the positive relationship between physical activity and disease prevention, and The Royal College of Physicians (11) and a British Heart Foundation working group (12) concluded, following comprehensive reviews, that there is substantive evidence that regular physical activity contributes to physical health.

In relation to coronary heart disease specifically, it appears that the preventive benefit of physical inactivity is on a par with other risk factors. The USA Coronary Pooling Project (13) estimated that physically inactive men increased their CHD risk by between 1.9 and 2.4, an increase of the same order as associated with hypertension at 2.1(systolic blood pressure>150mm mercury versus≤ 130mm mercury), hypercholesterolaemia at 2.4, (plasma cholesterol > 6.9 mmol/l versus < 5.6 mmol/l) and smoking at 2.5 (smoking ≥ 20 cigarettes per day versus not smoking). Paffenbarger and colleagues (7) quantified exercise participation of a large cohort of college graduates with a questionnaire repeated on two occasions 11 to 15 years apart. Mortality data was then collected over the subsequent eight years. It was found that subjects who reported participating in sports activities of a moderate intensity or who had taken up a sport in the intervening period of the two questionnaires, had a risk of dying from any cause that was 23 to 29 percent lower than that of subjects who never participated in sport activity. The death rate from coronary heart disease was also lower, even after correction for several coronary risk factors. Berlin and Colditz (14) carried out a meta-analysis of twenty seven studies in relation to habitual physical activity and the primary prevention of coronary artery disease and concluded that regular exercise did seem to provide a protective effect against coronary artery disease and that methodologically stronger studies showed a larger benefit than less well-designed studies. In a large prospective study of over thirteen thousand people (of whom over three thousand were women), Blair and colleagues (15) were able to show a gradient in mortality across fitness ranges. Age adjusted all-cause mortality rates declined across physical fitness quintiles from 64.0 per 10,000 person years in the least fit to 18.6 per 10,000 person years in the most fit men. The figures for women were 39.5 to 8.5 respectively. Again these trends remained after statistical adjustment for other risk factors.

Whilst it is plausible that regular physical activity confers protection against coronary artery disease, it is very difficult to prove cause and effect in primary prevention. The existence of related variables and selection bias have made it difficult to interpret previous research of an observational nature. It may be that people who are physically active are different in other ways that account for the lower incidence of coronary heart disease or people who are ill and hence at a higher risk of coronary heart disease might be more likely to be sedentary. Additionally, individuals who are regularly physically active may be more likely to adopt other 'healthy lifestyle' behaviours (16). There are also difficulties from methodological, ethical, compliance and financial standpoints. This thesis however focuses on the promotion of health and well-being and does not concern itself with cause and effect issues relating to disease prevention.

Physical activity and mental health

There is considerable acceptance of the view that regular exercise can positively influence mental illness, in particular help reduce anxiety and depression (17, 18). Evidence linking physical activity with psychological well-being comes from a number of sources. From epidemiological studies in the USA and Canada (19, 20) symptoms of depression and lack of psychological well-being have been correlated cross-sectionally with lack of recreational activity.

The relationship between exercise and levels of stress in the population is an absorbing area for research. In a meta analytic review of thirty four studies, Crews and Lander (17) found that aerobically fit subjects had reduced psychosocial stress response compared to control groups. These authors suggested that exercise acts as a coping strategy or serves as an 'inoculator' to more effectively respond to the challenge of psychosocial stress. It remains unclear, however, whether exercise reduces stress or fitter subjects can recover faster. The problems facing the researcher in the area of exercise and psychological outcomes are considerable; in the main there are three methodological issues, namely measures of psychological experience, potential confounders and drop-out (21). A recent well designed UK study examined the psychological effects of exercise training and found that psychosocial benefits were seen in the moderate intensity and not in the high intensity or attention/placebo groups (22); these effects were not the outcomes of improved expectancy or other features inherent in structured activity but only appeared when an aerobic component was present.

There seems to be a large potential for exercise to play a positive role in rehabilitation from a medical condition, coping with a chronic illness, dealing with reproductive events (menstruation, pregnancy, menopause) or dealing with the consequences of ageing. Most of these areas require well controlled research (23). Moses and colleagues (22) reported that controlled studies on normal populations have not shown a clear pattern of results and furthermore most studies have used college students and therefore generalisability of findings are uncertain. In relation to reproductive events in women's lives anecdotal evidence is now being replaced by empirical evidence showing that exercise can have a particularly beneficial role (23-25).

Physical activity and the quality of life

The natural loss in functional capacity due to ageing from middle to later years is greatly exacerbated by physical inactivity. It has been reported that 50% of what we currently note as ageing is now considered to be hypokinesia, a disease of "disuse"

(26). When thresholds of functional capacity are reached, quality of life can become seriously affected. Hardman (27) cites a telling example: traffic signals assume a walking speed of 1.3 to 1.4 ms^{-1} whereas a comfortable walking speed for a woman of about 80 years is 0.9 ms^{-1}. Confidence and moreover independence are in danger of being lost. The potential benefits to persons with chronic conditions should not be overlooked. There is now mounting evidence to suggest that whilst chronic conditions cannot be cured by being physically active on a regular basis, they can be more effectively coped with (28).

How much physical activity is recommended for health maintenance/health gain?
Physical activity dependent on type, frequency, intensity and duration will activate many of the body's systems (e.g., muscle, skeletal, cardiorespiratory, neuro-endocrine, gastrointestinal, immune) and produce health related benefits. The specific characteristics of physical activity in relation to a specific health outcome will in turn determine whether an individual will benefit. For example, bouts of low to moderate forms of aerobic exercise over a long period are required for weight loss whereas, much shorter bouts of moderately high resistance exercise are required for increase in bone density.

Recommendations as to the amount of physical activity required have been formulated by the American College of Sports Medicine(ACSM) (29). Early position stands by the ACSM supported the hypothesis that there is a minimum intensity or threshold required to stimulate an improvement in health. An alternate hypothesis to a threshold level of intensity states that the response to exercise training is dependent, although not entirely, upon the total energy expenditure and not intensity. The danger of the former hypothesis leads to a perception that there are few, if any, benefits to an exercise programme which does not reach this minimum threshold (30). New guidelines on physical activity and health have been published by the ACSM and the Centre for Disease Control (31). Essentially, this statement supports the total energy expenditure hypothesis as opposed to the minimum threshold one. The guidelines stated that sedentary individuals: 'should accumulate 30 minutes or more of moderate physical activity over the course of most days of the week.

1.3 Participation rates in physical activity
Participation rates in regular physical activity in the U.K. remain very low (32-34). It is estimated that only one third of the adult population take enough physical activity to develop or maintain a health benefit (34). In the context of exercise participation, as distinct from habitual physical activity, three demographic features seem to persist:

rates vary according to age and sex i.e. women are less active than men, rates drop with age and a negative gradient exists from professional to manual occupation.

1.4 Behaviour change theory

It is important to be clear that the most important determinants of health lie outwith the remit of the National Health Service. The Black Report of 1982 (35) argued that social and economic factors such as low income, employment, environment, housing, transport remain outside the role of NHS policy. The difficulty of working at the physical activity-health interface therefore should not be underestimated. Whilst a number of theories and models in relation to behaviour change have been reviewed, no one position has emerged to capture the interest of a critical mass of researchers (3, 36, 37). The dominant paradigm of medical science is the bio-medical model and can be described as a mechanistic one, separating the functions of mind and body. Despite the advances of psychosomatic medicine over the last fifty years, the bio-medical model remains the dominant one (38). Within the new public health movement (39), it is proposed that the traditional biomedical paradigm be *expanded* to the biopsychosocial model. The basis for this proposal rests on a number of points:
i) social and psychological factors do influence health,
ii) individuals do not exist in isolation; they live in communities and these communities influence health,
iii) the patient is viewed as an individual person (the holistic standpoint),
iv) the biomedical model does little to promote prevention, health enhancement and individual responsibility for health (38).

It is well documented that behavioural factors are implicated in seven out of ten leading causes of death in the United States of America (40), and thus the expanded biopsychosocial model is presented as a more realistic paradigm in the light of the important role which lifestyle plays in disease prevention. Approaches to changing behaviour should however be accompanied by environmental or structural change e.g., policy implementation. There is little point in extolling the virtues of, say, healthy eating in deprived rural areas when it is known that there is limited choice of food available in local shops. In this particular context improving the range of low price foods in such communities would be far more realistic. In the same vein any initiative to change behaviour in physical activity should take into account the context in which any planned change occurs.

1.5 The workplace setting- theoretical considerations

In a major review of health promotion in the workplace, Stanislav and Serxner (41) concluded that the literature was somewhat of a 'methodological and theoretical

wasteland' with little opportunity to derive generalisable principles or conclusions. In a review of health promotion in the workplace (commissioned by the Department of Health for the Workplace Health Promotion Task Force) the authors concluded that the literature from UK studies was very limited (42). Given this paucity of material it is difficult to apply theoretical models to a research study. However, one particular model has begun to attract research interest - the transtheoretical model. Based on original work in cessation of health diminishing behaviour, the model has been adapted to the field of health enhancing behaviours and in particular to physical activity (43). It has been adopted by the Health Education Authority in England to assist in the training of health professionals to better understand behavioural change(44). There is growing interest from researchers as witnessed by a numbers of papers presented at two major conferences using this model (45, 46). The transtheoretical or "Stages of Change" model, as it is commonly referred to, will be reviewed and critiqued in detail in the next chapter.

1.6 Promoting health in the workplace setting

Health education/promotion departments of Scottish Health Boards/Trusts have adopted a structure in line with programme areas of the Health Education Board for Scotland (47). Programmes are structured through key *settings* notably, schools, workplaces and other settings in the community where people spend their daily lives. The National Health Service (NHS) is the largest employer in Scotland, employing one in fifteen of the employed population in Scotland (48). The *Framework for Action* report stated that Health Boards (and now presumably Trusts) have a responsibility for both staff health and health education (48).

The workplace as a setting for general health promotion has received considerable endorsement and positive appraisal (49-51). In particular, the literature gives weight to the considerable facilitating factors which enable change to occur: high proportion of potential recruits, informal and formal communication networks, convenience and social support (41). Benefits can be summarised into three main areas: lifestyle or health behaviour change, economic benefits and the benefits to the job in terms of environment or organisational change (42). The supporting mechanisms which exist are usually emphasised whilst little recognition is paid to any confounding or inhibiting factors which undoubtedly exist in any organisation (52).

A report (53) on workplace health promotion in seven EC countries concluded that awareness of health promotion was low and still focused on traditional health and safety issues, that there was a gap between legislation and reality and that there was an urgent need for evaluation of health promotion. A recent literature review of

health promotion in the workplace described the variety of programmes or initiatives as falling into two basic categories (54). The North American approach has tended to focus on individual health behaviour change whereas the Northern European approach, most notably in Scandinavia, has been directed towards structural and legislative changes in the workplace with trade unions playing a central role. This dichotomy may in fact become blurred as programmes which aim to change individual behaviours take due cognisance of the working environment.

Physical Activity in the workplace setting

National policy statements on health such as *The Health of the Nation* (55) and *Scotland's Health - A challenge to us all* (51) view physical activity as a key topic area for action and with respect to the former publication, an area in which objectives or 'targets' are to be set. The current strategic plan of the Health Education Board for Scotland includes physical activity as one of ten main topics for programme implementation (56).

Research from North America has indicated that only a small percentage of the overall workforce (40% for on-site and 10-20% for off-site programmes) take up the offer of 'exercise' opportunities (52). It should be noted that these figures refer to teacher led, structured on-site exercise classes. In a review of North American workplace health promotion, Stanislav and Serxner (41) stated that 'exercise/fitness' programmes were ideally suited for the workplace with the provision of programmes popular to both employer and employees. In a review of workplace health promotion in Scotland, Jones and Ross remained unconvinced as to the value and effectiveness of exercise promotion (57).

1.7 Individual Interventions

Fitness 'testing'

The term 'testing' has been used in many instances where assessment would have been more appropriate. Testing normally includes the following criteria i) fitness components are measured at maximum exertion, ii) the test has a sport specific bias, iii) it is undertaken in a laboratory or sport specific setting, iv) results are compared to sport specific norms and v) the test can be taken individually or in a group. In keeping with a sport performance bias, results of the test are viewed in a pass/fail framework.

The term 'assessment' is taken to apply to the measurement of those fitness components of physical function which relate to health rather than sport performance. The criteria for assessment purposes are:- i) the measurements are taken at sub-

maximal level (especially for cardio-respiratory function), ii) the range of physical fitness components are evaluated in the light of health or wellness gain, iii) the assessment is undertaken in an unimposing environment, iv) results interpreted as a baseline for improvement, v) the assessment is undertaken individually where confidentiality of information is assured. It would seem that testing is more appropriate to a sport environment with the outcomes focusing on the enhancement of sports performance. In this thesis the more general term of 'assessment' is used to refer to the maintenance or improvement of health related physical fitness.

A typical fitness assessment will involve measurement of the four components of health related fitness i.e. aerobic endurance, body composition, flexibility and local muscular endurance. The measurement of fitness components can serve four functions, namely scientific, diagnostic, educational and motivational (58). Scientific measurement prioritises the collection of accurate data with emphasis on validity and reliability of test measures. Feedback to subjects takes the form of comparison to norm referenced tables. Diagnostic testing is concerned with measuring certain components which have a specific function, e.g. pre-employment medicals or yearly medical check-ups; it is also used in an occupational context where specific fitness components (muscular fitness for firemen or morphological fitness for air cabin crew) are regularly monitored. Such types of testing form part of a chain of interventions which may ultimately lead to behaviour change. The American College of Sports Medicine has stated that fitness assessment, if used for non-diagnostic purposes and carried out by trained personnel, 'may be useful in educating participants about exercise and physical fitness and help to increase motivation to exercise in sedentary individuals ' (59). However, fitness assessment has a number of inherent problems: genetic endowment contributes to aerobic fitness score, loss of adipose tissue through dieting alone may account for improved aerobic fitness score, reproducibility error is high and the fitness measurement tools may not be responsive to changes in physical activity.

The procedure involved in carrying out a fitness assessment is costly and labour intensive. In addition, there are major difficulties in carrying out re-tests with the general public due to change in individual circumstances e.g., gaining/losing employment, illness and family commitments. From research carried out by the main author, it was found that only one of the five Health Boards which carried out fitness assessment, had included some form of follow-up facility.

Exercise Consultation

Dishman (2) carried out a meta-analysis of interventions to increase physical activity or exercise and concluded that exercise consultation had shown potential efficacy ("it

can work") for increasing exercise and physical activity but its effectiveness ("does it work?") for such remained unclear. An exercise consultation involves structured dialogue between a health professional and subject in a comfortable, non-imposing environment. Drawing on relevant theory on exercise adoption and motivation, the exercise consultation is divided into a number of component parts (60). These parts include decision making, self-monitoring, self re-inforcement and goal setting. The purpose of the dialogue begins with initially encouraging the subject to explore and communicate the reasons surrounding their current physical activity lifestyle. The consultation then switches focus to ways of initiating and supporting behaviour change. Whilst it is important that the subject is placed in an environment which supports two-way dialogue, it is equally important that the areas of discussion remain confidential to the both parties.

1.8 Statement of Problem

The majority of health related research in exercise and sports science has been from a biological perspective. As such it is easier to answer the question "what happens to our body when we exercise?" than we are to answer the question, "what determines whether someone adopts a physically active lifestyle?" or "what happens psychologically during and after participation in exercise?(3). From a public health perspective, an equally important question can be added, namely: "what types of intervention are effective in increasing physical activity levels in sedentary adults?"

In a major review of the determinants of physical activity interventions in adults, King and colleagues made a number of recommendations for future research, one of which stated that there was a need to:

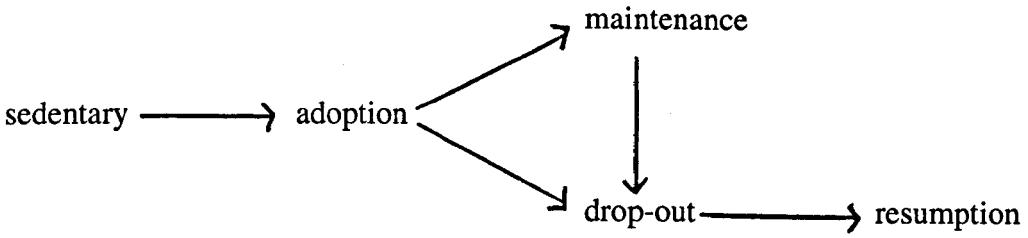
> "Evaluate methods of physical activity assessment and intervention designed to increase individual adoption, maintenance, and relapse prevention of physical activity in the clinical setting, worksite setting and various community settings" p232 (37).

Fitness assessment within a health promotion context is seemingly attractive (3, 39) but there is little objective account as to whether and with whom this form of intervention is effective.

Evaluation

Sallis and Hovell (61) have constructed a framework or "natural history" of exercise to highlight the multi-factorial nature of exercise behaviour. This framework allows the antecedents or determinants of exercise to be studied at different transition stages. The framework is illustrated in Fig.1.1

Fig 1.1 The major phases of the "natural history" of exercise



The model suggests three principal transition phases, from sedentary behaviour to exercise adoption, from adoption to either maintenance or drop-out and finally from drop-out to resumption. From a public health perspective, it is vital to encourage and support the least active/fit part of the population to adopt and then maintain physical activity on a regular basis.

In comparison to the field of research in exercise science and epidemiology, health related exercise interventions on sedentary adults in a 'free-living' situation is a recent though growing area for academic research. This research involved recruiting subjects who were sedentary and were in an appropriate stage of behaviour change. The main researcher was responsible for formulating and piloting a questionnaire which could recruit appropriate sedentary subjects. Additionally, a questionnaire which could monitor changes in leisure time physical activity was formulated by the main author; this involved a great deal of developmental work.

Subjects' leisure time physical activity levels and psychological well-being were then monitored over the time period of the research. The dependent measure of physical activity can be described as an intermediate outcome or 'middle stage' measures (62) this being simply a measure of the influence of health education or promotion on the behaviour of an individual. In short, it is the process an individual goes through to achieve a "final" health outcome.

Cost effectiveness studies require considerable resources in terms of time and finance. Moreover, cost effectiveness was not chosen as a measure due to the lack of suitable models for evaluation in health education/promotion (62).

1.9 Structure of Research

Three studies were carried out in this research; each study had a number of questions or objectives to address:

Study 1

Focus Community Centre, Saltcoats, Strathclyde Regional Council

To examine methods of recruiting sedentary subjects

To appraise the feasibility of an exercise consultation

To formulate fitness assessment and exercise consultation pro-formas

Study 2

Ayrshire Central Hospital, Irvine, North Ayrshire and Arran NHS Trust

To take account of findings from preparatory study

To devise efficient methods for contacting sampling frame

To improve appropriate tools to recruit sedentary staff

To improve appropriate tools to monitor change in dependent measures

To consider methods of intervention betweeen pre- and post test

To devise training for research assistants

To use data for statistical analysis

Study 3

Crosshouse Hospital, Kilmarnock, North Ayrshire and Arran NHS Trust

To recruit a large sample of sedentary staff

To modify interventions/dependent measure tools in the light of pilot study

To analyse data on the effectiveness of interventions

1.10 Reservations and Limitations

Experimental Validity

Validity and reliablity of dependent measure in physical activity

An adapted form of the seven day (7d) recall questionnaire of leisure time physical activity (63) was used to measure change in the dependent variable of physical activity. LaPorte (64) carried out a review of the methods of assessing physical activity and concluded that recall questionnaires are the most pragmatic in free living population studies.

Internal Validity

As staff volunteered to participate in the three studies, there may well be a self-selection bias with certain characteristics of subjects responsible for observable change. With respect to studies two and three, a number of important changes were made. The stages of change questionnaire selected only sedentary staff who intended to increase their physical activity levels. These staff were then randomly assigned to one of three interventions. To reduce confounding factor bias a 'control' group was introduced. It is extremely difficult to have subjects act as a control group in a 'free-

living' research study. One group of subjects was given an information booklet and described as a limited intervention group.

Expectation effect

It has been suggested that few experiments pay sufficient attention to the issue of expectation effect (16). Subjects are not blind to the intervention nor to the amount of effort and time which is spent with them. A study is therefore susceptible to a confounding variable produced by the differing demands of each type of intervention. In a true experimental design it is necessary in the first instance to ensure that control subjects have expectations of equivalent benefit from the intervention and control conditions and secondly, it is necessary to check that subjects have comparable expectations of benefits. In the first case a limited intervention group was utilised as a "control group" and in the second case whilst it was not practical to ensure that the duration of each intervention was the same, an expectation questionnaire was developed to probe any differentiation.

External validity

A workplace setting produces a *unique set* of social and environmental conditions specific to that setting which can support or prevent positive change. It is important to give due note to any such conditions which may have had a strong bearing or influence in changing behaviour. Thus caution should be exercised when applying the findings to other employees and other workplace environments.

Balance between external and internal validity

In order to strike an acceptable balance between internal and external validity in the research design, little on-going intervention was carried out between pre- and post test. Researchers have advocated a succession of small and on-going interventions in health promotion (41, 42). By providing substantial on-going support throughout the research study, it becomes increasingly difficult to be certain which single aspect or aggregate of these successive interventions are responsible for change in subjects. Jamieson and Flood (16) have outlined the balancing act between the twin concerns of internal and external validity in research methodologies. A study which had regular on-going support would involve a high level of experimenter attention or contact. This high level of support would probably lessen the rate of drop-out of subjects in the study which in turn would lessen the likelihood of confounding factor bias. Such a study would have internal validity but would have limited external validity.

The discussion of balance between internal and external validity draws out an important distinction between what is feasible in experimental research of this nature from what is desirable in a health promotion study. A research study has to de-limit the area of interest and thereby focus on what is both measurable and achievable in a given time frame. The research study may have used the workplace as a convenient location, essentially working 'in' and not 'on' the workplace. This research, however, did not set out to change the structural or organisational components of the workplace environment. Moreover, preliminary findings revealed that the conditions were appropriate for individual interventions used in this study.

1.11 Summary

Although physical activity contributes to health and well-being, levels of physical activity in the adult population remain low. Research has tended to focus on the risks of physical inactivity and disease, and the effects of exercise training on physical functioning. An emerging area of research, drawing upon the disciplines of psychology and sociology, attempts to unravel the complex domain of health related behaviour change. The determinants of physical activity behaviour are now better understood as is the appreciation of the different stages of the dynamic processes which an individual goes through in the cycle of lifetime physical activity. To date, there has been little rigorous evaluation of health promotion in the workplace setting and of the effectiveness of exercise interventions of adults in free living situations.

From a public health perspective it seems that the greatest gains will be achieved when the least fit/active take moderate intensity forms of physical activity on a regular basis. The specific context of this research centred on sedentary NHS employees using the workplace as a setting for bringing about individual change in leisure time physical activity. A general feature of the context stems from the new North American guidelines (31) on the health benefits of accumulated moderate intensity levels of physical activity on previously sedentary adults. Health education/promotion efforts are likely to place weight on the value of diverse forms of physical activity on a day to day basis. There is also likely to be a corresponding de-emphasis on the role which fitness is to play in efforts to change the sedentary 'lifetyles' of adults.

Using relevant theory of behaviour change, sedentary NHS employees of two large hospitals in Ayrshire were recruited as subjects to studies two and three. Subjects were then randomly assigned to one of three interventions: fitness assessment, exercise consultation and information only.

The research aimed to shed light on the ability of individualised interventions to change health related physical activity behaviour. The research tested the hypothesis that exercise consultation is more effective than fitness assessment in increasing the physical activity levels of previously sedentary adults.

The value of this study is that its results will inform health education professionals which, if any, individual forms of intervention are effective in helping sedentary adults become more physically active. As the work of health education/ promotion shifts from specifics of exercise and fitness to the more generalised concept of active living with a focus on physical activity, this research hypothesises that exercise consultation will have a greater initial impact than fitness assessment on adoption. By concentrating on the personal history and social background of subjects and focusing on the skills of each individual, it is further hypothesised that exercise consultation will result in positive behaviour change which will be sustained over a period of time.

Chapter 2

Review of Literature

"There are no standardised professional guidelines for practice designed to increase and maintain exercise and physical activity "
[Dishman R K, *Predicting and Changing Exercise and Physical Activity: What's practical and what's not* pp 97-106 Toward Active Living 1994 (2)]

Introduction

This chapter clarifies the operational definitions of terms and concepts in the research. The general health status of Scotland is depicted and the impact which physical activity can have on health is explored. Levels of health related physical activity in the Scottish adult population are portrayed with comparisons to England and Wales. The organisational structure of health promotion by way of settings is described. Next, the workplace setting for health promotion programmes with particular relevance to exercise is critically appraised. The chapter then describes and critically reviews the literature in the area of individualised exercise interventions, namely fitness assessment and exercise consultation. Behaviour change theory is reviewed and the transtheoretical theory or stages of change model is analysed. The choice of dependent measures within the context health related physical activity are clarified. Finally, the research questions are re-stated in the light of the above literature review.

2.1 Operational definitions

Physical Activity

This research focuses on health related leisure time physical activity. Terminology in the field of physical activity is confusing, with terms often overlapping or used synonymously (3). It is important therefore to clarify the operational definitions within this research; the basis for these definitions emanate from an international conference on exercise, fitness and health held in Toronto in 1990 (9). The term *physical activity* encompasses any body movement which results in a substantial increase in resting energy expenditure. Walking with a dog or to the shops, activity in and around the house e.g. DIY and digging the garden would fall into this category. In some instances the 'exercise component' of physical activity is 'hidden' e.g. walking to and from work, or in the physical demands of any occupational task. For some individuals however, this component of habitual physical activity can be perceived as exercise.

Exercise and Sport

A distinct category of physical activity is *exercise*. Exercise can be viewed as a subset of physical activity except that the activity is chosen, planned, structured in timescale and has a specific function e.g. losing /gaining weight, improving body image, meeting up with friends, improving a skill. In general terms the public perceive exercise as leisure time physical activity. Examples of this are weight training, swimming, jogging etc. The term sport in this research applies to any

physical activity which demands substantial increase in resting energy expenditure and which involves a competitive element, bound by rules or laws.

Physical Fitness

Fitness is operationalised in present day Western societies with a focus on two goals: sports performance and health (10). Sporting performance is strongly associated with specific fitness requirements. Performance related fitness components include general features such as power, speed and agility and specific ones such as high lactate level tolerance, explosive leg power, lower and upper body muscular endurance (65). "Health related fitness" refers to those components of fitness that are affected positively or negatively by physical activity and relate to health status. The term has been used to note fitness as it relates to health promotion and disease prevention, defined by Pate (66) as: a state characterised by i) an ability to perform daily activities with vigour and ii) demonstration of traits and capacities that are associated with low risk of premature development of hypokinetic diseases (i.e. those associated with physical inactivity). This dichotomy in the use of the term fitness has led to potential areas of confusion. Hardman (67) maintains that this confusion arises because the traditional tests which aim to measure fitness actually measure *performance* or an attribute related to performance. She defines fitness as 'a product of regular exercise...(whose) characteristics are acquired - not inherited'. This stance is in contrast to Caspersen, Powell and Christenson (4) who define physical fitness as: a set of attributes that people have or achieve that relate to the ability to perform physical activity. In operational terms fitness can be understood in terms of the components that should be taken into consideration when undertaking an assessment; the components of a fitness assessment used in this research are fully discussed in chapter three.

Health and Health Education

Health can be defined as a human condition with physical, social, psychological and environmental dimensions. As health is a complex concept a simple definition is hard to come by: absence of disease and health being the "opposite" of illness perhaps reveal what health is not (68). A functional definition on the other hand e.g. the ability or capacity to hold down a physically demanding occupation, is too prescriptive and fails to encompass the broad spectrum of health. The removal of the word 'complete' from an early definition by World Health Organisation provides a more comprehensive base to use: 'a state of (complete) physical, mental and social well-being and not merely the absence of disease or infirmity' (69). Health education can be defined as the process of transmission and/or acquisition of knowledge and skills necessary for survival and the improvement of quality of life (70). Health

education is therefore a *communication* activity aimed at enhancing health through influencing the knowledge, attitudes and behaviour of those in power and of individuals within a community (71).

Health Promotion

At its broadest level health promotion is concerned with all activities to improve the health of individuals and communities (72). Such a description is diffuse and blurs the distinctions between powerful, established areas of health service provision. Due to the nature and breadth of health promotion it is difficult to put forward *a* definition. Indeed, Macdonald and Bunton (73) have noted both the number and varied definitions of health promotion. This feature is noted as an indication of the rich diversity of disciplines which contribute to the field of health promotion rather than any inherent flaw. A definition of health promotion therefore will relate to the nature and extent of both the intervenor and the intervention. Tannahill (71) has proposed a model of health promotion which is comprised of three overlapping spheres of activity- health education, health prevention and health protection. Health prevention is concerned with reducing the risk of occurence of a disease process, illness, injury, disability, handicap or some other unwanted state (74); health protection is concerned with legal or fiscal controls, other regulations or policies aimed at the prevention of ill-health or the positive enhancement of well-being (71).

An example from the field of health related physical activity may provide some clarification. In an effort to increase the amount of physical activity undertaken by sedentary adults, the health professional is likely to be involved in both health education and health promotion activities. Information on the benefits of becoming physically active and advice about how and where to take more activity, and support to an individual to maintain initial behaviour change fall into the health education domain. In the health promotion domain, the health professional may be involved in setting up agreements with the Local Authority leisure services to reduce the price of a swimming session over a certain time period. There may also be developments between agencies (Health Board/NHS Trusts and the Local Authority Leisure Services) to have a shared *policy* on joint working and setting of aims (75).

The operational context of health promotion

Epidemiology has not only contributed to but greatly influenced the agenda for health education and promotion resulting in a problem-based (disease or risk factor) approach (68, 76). This approach has led to a number of difficulties both at operational and methodological levels (47). The World Health Organisation has advocated a new "settings based" approach (76) in recognition of the fact that (i)

different aspects of a person's lifestyles are associated with the different setting in which that person lives, reproduces, learns, works, utilises different services, enjoys leisure, etc. (ii) each setting has a characteristic structure, norms, participants, communication, interaction and values and (iii) a setting is part of a wider system and is interdependent with other parts of the system, in terms of providing services or mounting interventions.

2.2 Scotland's Health

The health of the people in Scotland is poor in comparison with the rest of Europe. Compared with other West European and developed countries, Scottish men have the shortest life expectancy; Scottish women are almost as badly off. Mortality rates for lung cancer in Scottish women are the highest with rates for Scottish men almost at the same level (51). Scotland's mortality rates from coronary heart disease (CHD) have for many years been among the highest in the world for both men and women (77). A baseline risk factor survey of Ayrshire and Arran revealed that CHD mortality rates in the area were above the Scottish average (33). In a recent article, 'How sick is the West of Scotland?', West and colleagues (78) noted that the highest all-cause mortality in Britain for both sexes occurs in the West of Scotland, specifically the Central Clydeside Conurbation; such comparisons based on mortality data tend to overlook the need to look more closely at morbidity data. Morbidity data is important as i) the determinants of disease and illness are not the same as the determinants of death, ii) a focus on mortality can divert attention away from a number of health problems which, while not life threatening can be disabling and distressing for example, musculo-skeletal problems and mental health problems, iii) mortality is not a good indicator of health for young and middle aged persons.

2.3 Physical activity and health

At a landmark conference on exercise, fitness and health in Toronto in 1988 there was a consensus statement as to the broad health promotion potential of physical activity. The consensus was that physical *inactivity* is a *major* risk factor for CHD mortality and that physical *activity* can make a major contribution to illness prevention, disease management, physical fitness and mental health (9). Blair and Connelly (1) noted that research on health and functional effects of physical activity over the past forty years has followed two main themes. The first theme focuses on exercise and the risk of disease and has led to a consensus position stand that physical inactivity is a major risk factor for CHD, and perhaps to some cancers, stroke, non-insulin diabetes mellitus and other health problems (15, 79). The second theme focuses on the relation of exercise to the improvement of functional capacity, usually measured as maximum oxygen uptake (VO_{2max}). Exercise training studies of this nature have

enabled the American College of Sports Medicine to publish precise statements on the exercise dose (frequency, duration and intensity) to produce given chages in physical fitness (29). The relative risk for cardiovascular or CHD mortality in the least fit compared with the most fit is 6.0 or more in recent reports (15, 80).

Recent studies have reported the use of physical fitness as the intervention variable in research on the effect of sedentary habits on health (15, 80, 81). Such studies using physical fitness as the exposure variable have the advantage that physical fitness can be more objectively measured than physical activity. By choosing fitness rather than activity there is presumably less chance for misclassification and may give a more precise estimate of the impact of sedentary habits on morbidity and mortality. The relative risks for CHD and all-cause mortality in unfit compared with fit men and women are substantially higher than those from physical activity studies (1). The weight of evidence shows an inverse gradient of risk of disease and illness across the dimensions of physical activity or physical fitness. This trend is seen for total amount of physical activity or fitness, and for intensity of activity.

The importance of physical activity to health and the risk of physical inactivity to ill-health is reflected in policy statements set out by national health authorities/boards. Exercise has been identified as a target area for action in national policy statements, such as Health Education in Scotland and the Health of the Nation (82, 83). In a five year strategy plan published by the Health Education Board for Scotland, physical activity would have a major general public programme initiative in years 1993/4 and in 1995/6, and would feature in one or more programmes in 1994/5 (56).

2.4 Physical activity levels in the UK

Participation rates in regular physical activity in the U.K. remain very low with an estimated two thirds of the adult population not taking enough physical activity to develop or maintain a health benefit (33, 34, 84). In Wales this figure is considerably less for women, with only 13% taking moderate or strenuous activity at least three times per week (the corresponding figure for men is 33%) (84). The Sports Council in conjunction with the Health Education Authority were responsible for carrying out a large scale descriptive study to collect baseline data on physical activity, fitness and health of the adult population in England; the report published in 1992 is commonly referred to as the Allied Dunbar National Fitness Survey (ADNFS) (34). The ADNFS drew up activity level scales for male and female age groups based on the number of occasions of activity of 20 minutes duration in the previous four weeks. When health related target activity levels were drawn up, it was found that **seven out of ten** men and **eight out of ten** women fell below their age appropriate activity level.

Two other main findings were noteworthy: firstly, one out every six people were relatively sedentary, having done no activities for 20 minutes or more at a moderate or vigorous level in the previous four weeks; secondly, Table 2.1 shows the health related target activity levels (%) of men and women at the age ranges 16 - 54 years (broadly covering subjects' age range in studies II and III).

Table2.1 Target activity levels (%) for age groups.

Age Group(yr)	16-24	25-34	35-44	45-54
Men	30	20	32	19
Women	9	7	16	11

The Scottish Heart Health Study (SHHS) was set up to establish the levels of coronary heart disease (CHD) risk factors in a cross sectional sample of Scottish men and women drawn from different localities (85). In the period 1984-1986, the study recruited a target of 450 male and female G.P. patients (aged 40-59 years) from each of the 22 districts throughout Scotland. The study looked at a number of risk factors including serum cholesterol, blood pressure, cigarette smoking and included physical activity at work and in leisure time. Regular 'strenuous activity' was assessed by the reported frequency of periods of activity which induced shortage of breath or perspiration. Table 2.2 shows the low frequency of self reported strenuous activity at leisure for men and women (86).

Table 2.2 Frequency of self reported strenuous activity at leisure- men and women (40-59 yrs).

	% at least 2-3	% Once	% Less then once
Men	14.1	13.8	72.1
Women	10.3	11.0	78.8

The Ayrshire and Arran Coronary Prevention Programme - Baseline Risk Factor Survey (33) utilised the SHHS to expand the sampling frame to include all four local district authorities in Ayrshire Arran, thereby producing a comprehensive picture of CHD risk factor incidence for the whole area. The target sample however included the age group 20 -39 years to the 40-59 year age group in the SHHS. Percentage figures for participation levels in 'vigorous exercise' in leisure time at least three times per week for men and women are given in Table 2.3.

Table 2.3 Levels (%) of leisure time vigorous exercise (at least 3 times per week) for men and women 20 - 59 years.

Age Group	20 - 39 years	40 - 59 years
Men	26	13
Women	15	10

In the context of exercise and sport participation, as distinct from habitual physical activity, three demographic features seem to persist: rates vary according to age and sex i.e. women are less active than men, rates drop with age and a negative gradient exists from professional to manual occupation (33, 34). A recent report from the Research Unit in Health and Behavioural Change at Edinburgh University on physical activity participation levels in the Scottish general public (aged 18 to 60 years), confirmed this general pattern (87).

2.5 The workplace setting

Around 60 per cent of the adult working population under retirement age is in employment in the UK, and those working full time spend approximately half their waking hours at work. The workplace is an important setting for health promotion, a fact which has been endorsed by the revised targets (14 and 25) adopted by the World Health Organisation for Health For All in the European Region: (88)

Target 14

By the year 2000, all settings of social life and activity such as the city, school, workplace, neighbourhood and home, should provide greater opportunties for health promotion;

Target 25

By the year 2000, the health of workers in all Member states should be improved by making work environments more healthy, reducing work related diseases and injury, and actively promoting health.

The Department of Health's Wider Health Working Group set up a special Workplace Health Promotion Taskforce to look at current provision, methods of marketing health promotion and mechanisms to evaluate effectiveness (89). In a review of workplace health promotion in Wales, Catford (90) declared this environment provided an important if not *the* most important social environment, with the potential to influence employees during working hours, outwith work and wider afield to each employee's family and neighbourhood grouping. A national policy statement in Scotland

endorsed the view that the workplace provides a unique environment for initiatives related to the promotion of health and well-being (51).

The workplace environment has attracted attention as a setting which is apparently intrinsically suited for health promotion initiatives (47, 51, 91, 92). Stanislav and Serxner (41) outlined the many advantages of workplace as a setting:

i) convenience,
ii) cost effective: access to large numbers of staff,
iii) availability of staff to participate,
iv) organisational structures to support and enable the programme,
iv) potential to build on indigenous peer social support network.

Notwithstanding the impressive list of the advantages of the workplace as a suitable environment, implementation of health related programmes are by no means straightforward. A European Foundation report (53) declared that action for health at work in Britain represented one of the greatest health promotion challenges in recent years.

Reviewers of UK health promotion in the workplace concluded that there was a general lack of evaluation and a distinct lack of any evidence that programmes were effective (42, 54, 93, 94). Waghorn (94) carried out a postal survey in Scotland of 1276 'managers of workplaces' and received a 55 per cent response rate. The sampling frame was taken from the Scottish Chambers of Commerce and Industry and is therefore liable to be biased towards larger workplaces and private sector businesses. The survey indicated that health promotion activities were not restricted to traditional health education but encompassed activities directed towards the environment, facilities and organisation.

There has been little research in the socio-cultural dimension of the workplace for health related behaviour change. One recent study focused on the social context as a way of explaining the growth and popularity of these developments (52); this study reasoned that there has been a growing emphasis within public health and the medical community on individual lifestyles and on person based risk factors. This paper also concluded that whilst exercise/fitness programmes were 'ideally suited' for the workplace the main confounding variable was the self selection effect i.e. the apparently fitter, healthier staff will opt to become involved in the first instance. This last point was confirmed by Conrad's research- 'Who comes to Worksite Wellness Programmes? A Preliminary Review' (95). Conrad found that whilst the definition of participation may vary, the range for on-site provision varied from 20-40% but for off-site provision the figure dropped to 10-25%. Further work by Conrad (96) on the

'special dynamics' of the workplace environment revealed that too often the participant's perspective was not taken into account when devising health programmes and that fitness rather than health is a more salient concept to approach potential staff.

Whilst open to the criticism of over-simplification, there is now general agreement that there are two main approaches to health promotion in the workplace namely, the North American approach and the Northern European approach (42, 54). The former has tended to focus on individual health behaviour change via 'worksite wellness programmes' whereas the latter has been directed towards structural and legislative changes in the workplace. It has been noted that the majority of health promotion interventions in the UK have taken place in large organisations and have adopted the lifestyle and health behaviour approach (54). Whatever approach is adopted it has been suggested that a broad range of strategies are required due to the diverse demographic nature of employment in terms of location, size, contractual obligations and nature of work (service/manufacturing) in Scotland (97). It is clear from the literature on workplace health promotion that the term (health promotion), is not a single unified concept but encompasses a wide range of activities and approaches. The simplistic dichotomy between the North American and Northern European model fails to adequately describe the range and type of initiatives or programmes which have been implemented. Table 2.4 depicts a useful schemata devised by Crosswaite and Jones (54), who outlined the key characteristic features, in bipolar form, of health promotion programmes.

Table 2.4 Characteristic features of health promotion programmes.

Dimension		Range	
Health range	single topic	<---------->	comprehensive
Target	individual behaviour	<---------->	structural factors
Ethos	workplace as setting	<---------->	workplace as determinant of health
Control	top down authoritative	<---------->	bottom up negotiated
Instigator	internal	<---------->	external
Goal	pragmatic	<---------->	idealistic
Evaluation	implicit outcome economic	<---------->	explicit process empowerment

It has been suggested that workplace health promotion can exist at a number of levels (90). In the first instance, health education can respond to the demands by helping individuals change their workplace practices or health behaviours. At a more advanced level, policies and services are reviewed to minimise dangers to health and provide opportunities for behaviour change. The third level takes a more fundamental approach by examining the socio-ecological perspective, for example, addressing the managerial and communication styles which could lead to psychological difficulties and unhealthy behavioural responses (98). For most employers and employees, the phrase and concept of health promotion have little meaning in the context of work, indeed one group of researchers declared that health promotion was not so much an unfamiliar concept but 'barely visible' in Scottish workplaces (57). Certain health issues have prominence for example, smoking and alcohol (where these issues may impinge upon the safety of everyone at work), but in general terms it is health and safety at work which is far more prominent and important. It should be added that a full literature review of health promotion in the workplace presents inherent problems as a substantial amount or work is undertaken outwith the term health promotion. A full literature review however, encompassing health and safety and occupational health would be unnecessarily large and disparate.

Dugdill and Springett (42) undertook a literature review of the range of evaluation studies in international health promotion interventions as part of the Workplace Health Promotion Taskforce mentioned above; the report concluded that the most effective programmes in terms of health benefits to employees, are those that involve both management and employee participation, that address the needs of the employee and offer a wide range of intervention backed up with on-going support.

Promotion of physical activity at work

Shephard (99) carried out a comprehensive economic analysis of North American programmes on the efficacy of workplace exercise interventions. The main findings documented increased productivity, decreased absenteeism, improved staff morale and increased health gain and concluded that company decision makers were more likely to be persuaded by personal commitment rather than by any economic one.

The implementation of physical activity interventions in the Scottish workplace context has been recently appraised (57). It was concluded that the major constraints of time, space and money were most frequently documented. Additionally, physical activity was seen as problematic as it was essentially a 'private' activity, undertaken in leisure time. The only positive note in this appraisal alluded to the possibility of

approaching leisure service providers to set up proposals for reduced memberships/entry to leisure facilities.

2.6 Exercise Interventions

In a review of fifteen major published studies on the effectiveness of programmes to modify exercise behaviour, Godin and Shephard (100) concluded that in general exercise interventions were inconclusive. These studies of adults varied greatly in design, methodology and evaluation measures which therefore made it difficult for any comparison to take place. For example, methodology was summarised as "medical screening and/or laboratory evaluation of subjects, followed by participation in group exercise programmes with varying levels of supervision by a physician and/or a paramedical professional". Apparently, evaluation measures included some form of attendance at organised/structured exercise classes. Poor research design was shown by lack of appropriate time scales between pre- and post-tests and lack of good measures of outcome.

Fitness Testing

An early retrospective study by Bruce and colleagues (101) on middle aged self selected male patients used fitness testing as a motivating tool to effect change in factors relating to coronary heart disease. Around 50% of sedentary subjects reported making an increase in the amount of physical activity undertaken. The study also showed that persons with functional impairment, as demonstrated by an exercise test, were more likely to be motivated to change one or more health habits over the next year. Bruce and colleagues noted the considerable reservations to their pilot study (retrospective nature, population sampled and the accuracy of data from questionnaires) but suggested that the apparently positive findings warranted a randomised controlled study to test the hypothesis of whether fitness testing can motivate adults to change behaviour.

In a quasi- experimental study of white collar workers, Cox and colleagues (102) studied the effectiveness of fitness testing on two groups of workers with one site acting as a control. Outcome measures of productivity and absenteeism were examined alongside impact measures of manifest anxiety and perceived health status. Surprisingly, all subjects including controls reported fewer medical symptoms. Unfortunately, these authors did not examine change in physical activity status even though structured exercise classes were provided.

In a study of the impact of fitness assessment with advice with sedentary employees Godin and coleagues (103) reported that this intervention failed to even change

intention to become more active. However, as this group had taken up the offer of a fitness assessment it should not be surprising that the magnitude of intention did not change. The authors concluded that fitness assessment would be beneficial in reinforcing intention, demonstrating a response to training and altering beliefs.

Another risk factor approach to exercise related health behaviour change looked at the impact of fitness testing combined with a 'Health Hazards Appraisal' (HHA) on long term change in physical activity (104). Previous research on HHA, which provides an estimate of 'health age' and gives the relative risk of dying within a ten year period, has been found to have a positive effect on health habits. Dependent variables were intention and behaviour change measured during and at three months post intervention. Neither intention nor behaviour change had significantly changed and any positive change was not sustained at a three month interval. The fitness test was a one-off occurrence with no follow-up measurement of fitness components. Moreover, the research was framed in a context of ill-health prevention rather than promoting health and well-being.

The popularity of health related fitness testing in the general community has been commented upon(39, 49, 58, 105, 106). In the 1984 Liverpool Garden Festival it was claimed that over 11,000 people were fitness tested (39). A follow-up at one year with two hundred and thirty four people found that out of the sixty seven per cent response rate, twenty per cent were taking 'more exercise'. In the school context, Fox and Biddle commented that although the practice of fitness testing had grown in popularity, the level of sophistication of the tests was poor, the interpretation of test results highly questionable (107) and the practice bereft of theoretical consideration (108).

Practitioners in the health domain (e.g. health educationists, primary care facilitators, physiotherapists) have tended to use fitness testing in the first instance as a means to attract people's attention so that other lifestyle issues e.g. smoking, nutrition can be discussed(58, 109). The evaluation of this practice is hampered by unsubstantiated reports on the effectiveness of fitness testing. One author goes as far as to conclude, "This strategy (fitness testing) provides a highly effective and practical approach to fitness promotion creating awareness, providing personal data and stimulating informed action" (106). There is no data from rigorous evaluation to support this claim. The Health Education Authority (58) takes an equivocal standpoint on the role and functioning of fitness testing. On the one hand it sees fitness testing as a "valuable opportunity to discuss a person's activity patterns and help to find areas where he or she might be able to be more active". However, it is critical of current

practice with the emphasis on an apparent immediate positive impact and lack of concern for the more long term behaviour change potential. In highlighting the current debate surrounding the area it calls for more detailed research.

Turner carried out a major study of the value and effectiveness of fitness assessment in a UK population (110). Five hundred and seventy five employees of the Paymaster General's Office were tested using 'Fitech' - a computer software led method of conducting fitness assessment. This group of employees (seventy per cent of whom were female) was made up of 60% regular exercisers. Seventy per cent of this sample were followed up at three months with 61% taking 'more exercise' in the intervening period. A small sample (N=43) was followed later at 12 months with 79% stating that they had taken more exercise 'at some time' during the last twelve months. Turner concluded that fitness assessment was valued by employees and 'enabled people to change their behaviour'. There is little doubt that employees in this instance found the project, which was free and carried out in work time, interesting and worthwhile but there is little to deduce from the findings. There was no control group, active and non-active subjects were grouped together for analysis and the dependent measure (physical activity) merely asked whether subjects had change activity level.

One other UK study which attempted to evaluate fitness assessment ended up with rather vague generalisations (111). A group of 412 manual and non-manual workers were invited for a fitness test and lifestyle evaluation. After a period of three months in which no contact was made, participants completed a follow-up questionnaire (67% response rate). The study reported that 67% of subjects changed exercise behaviour over time. There is little to deduce from this study: there was no control group and subjects' activity levels were not measured at pre-test. The dependent measure of physical activity by self report simply asked whether they had 'carried out the recommendations for amount of exercise' (112).

With respect to public testing stations either at community or worksite health events there is generally very little information available on their effectiveness. Only one third of reviewed studies on fitness promotion programmes to modify exercise behaviour evaluated long term cost effectiveness and cost benefit. Two thirds evaluated only the immediate effects of the promotion (3).

Heartbeat Wales, a national health promotion campaign used fitness testing extensively in a community setting to inform, educate and change people's behaviour in relation to health related exercise. A report by Heartbeat Wales (113) stated that fitness testing was a powerful motivational tool and was used 'partly because of its

popularity with the public who like the idea of a measure of their fitness status and progress, and partly because of its popularity with health promoters who find that it is an excellent opportunity for discussing the significance of the results and for passing on other information'. The fact that numbers of sports performers were attending these events seemed to raise issues of the inability of health promotion officers to answer 'awkward' questions rather than on the intrinsic appeal of testing to this population group. In a subsequent survey report (114) it was stated that fitness testing had been 'successful' at public exhibitions and pointed to it's potential development in other settings such as schools, occupational health and recreation centres. The notion of success of this approach is questionable as feedback was obviously undertaken in a public setting, no follow-up procedure was implemented and health promotion fieldworkers had a basic training in only the technical aspects of fitness measurement let alone education in the principles of health related exercise science.

Exercise consultation

Exercise consultation is a fairly recent development. Long and Haney (115) in the mid-eighties found that 'counselling interviews' undertaken by a trained counsellor initiated an active lifestyle in previously sedentary women compared to a control group. In 1989, Harris and colleagues (116) acknowledged that whilst there was little objective evidence for the effectiveness of physical activity counselling by primary care physicians, preliminary data did reveal that a positive effect could be achieved and that this form of counselling should be routine in the setting of clinical practice. King and colleagues (37) in a major review of health related exercise interventions, echoed this statement and called for 'a standardised ...counselling protocol for physical activity promotion in the clinical setting'. More recently, The American College of Sports Medicine and the North American Centre for Disease Control (117) issued a joint statement which advised physicians and other health professionals to 'routinely counsel all patients to adopt and maintain regular physical activity' and for educators of physicians and other health professionals to 'develop effective ways to teach physical activity counselling and incorporate them into the curricula for health professionals'.

The consultation process attempts to assist an individual in becoming more physically active by discussing individual, social and environmental factors which either prevent or support positive change. This process differs fundamentally from fitness assessment by removing reference to population norms. The consultation focuses on what is wanted by the individual and then what is achievable by the individual given the scope for potential change in his or her situation. The author contends that it is a far more realistic process as it discusses what is achievable "right now" in active

living terms rather than in the longer term gains of fitness. In a controlled health promotion study of older employees of a university, Sharpe and Connell (118) concluded that exercise interventions should address perceived barriers, encourage participants to set realistic goals and provide opportunities for individuals to gain positive experiences. A more detailed structure as to what an exercise consultation entails and the reasoning behind the emphasis on consultation rather than counselling has been set out by Loughlan and Mutrie (60).

2.7 Behaviour change theory

There is a strong case that promoting and improving health comes down to more than health *behaviours* and is determined by wider social and political forces. To concentrate simply on theories of individual behaviour change will narrow the focus of intervention and therefore limit effectiveness. It is argued that it is equally important to analyse the social conditions, the physical environment and the political forces which operate within society as a whole. The debate seems to centre on the individual approach versus the wider, more comprehensive systems or structural one. Green and Raeburn (119) in discussing the apparent polarised approaches to health promotion remarked, "a theoretical and sometimes an ideological division -or more accurately, spectrum - cuts across the field. Broadly, this can be characterised as the "individual versus the system" debate".

It is clear that whichever theory is used to underpin behavioural change, it must give equal account to the individual and the context: neither people nor environment should be seen in isolation. As Green and Raeburn pointed out, "each is nested in systems that profoundly affect behaviour and health". If there is an element of 'heal thyself' in the individual approach it can be equally argued that there is a tendency to blame the system on the other. It is claimed however that these divisions are more academic in nature and that examples from the world of health promotion display an integrated 'person-environment' approach where the responsibility for health is shared between individuals and systems. The author puts forward the view, developed later in the chapter, that an exercise consultation is carried out in such a way that individuals and their environments are considered as a whole and as such partly addresses the individual *v* system dilemma.

Reviews of previous initiatives however have highlighted a disturbing range of deficiencies from inappropriate theory to the distinct lack of any theoretical base(120). Whilst there has been a shift from psychological models of change to the more socio-psychological models increasing the emphasis on socio-cultural influences on behaviour change, it appears that the shift has not been strong enough:

the models (health beliefs model; the social or cognitive learning theory; theory of reasoned action) fail to draw fully on relevant social theory (120). It seems that more specific analysis and account of social processes of group dynamics and the interaction with the social structure is required so that social processes and context are woven into health initiatives.

Change at individual level

No one single theory can encompass health related change. It was commented above that there is no one single discipline or even a single core discipline which accommodates health promotion therefore the adoption of a guiding theory will be based on a pragmatic but sound base. Green cautions the practitioner to be wary of accepting measurability as the sole criterion for usefulness and holds that the practitioner should,

> "seek to assimilate all the theories presented rather than select a favourite... construct a framework with meaningful hooks or rubrics on which to hang the new variables and insights offered by different theories" (121).

The main theories/models which have been applied in the field of health related exercise have been reviewed by a number of authors (3, 36, 37, 122). The authors concluded that as yet, the uniqueness or redundancy of any model has still to be clarified. Chapter one touched upon the dynamic nature of exercise change. The composite model outlined by Sallis and Hovell (61) provided a graphical display of possible sub-groups between the active and non-active individual. But as Wankel and Hills (123) concluded "the adoption of an active lifestyle is an on-going, dynamic process. It is not simply a matter of being active or not". Early reviews of exercise literature noted the importance of understanding stages of exercise behaviour (for example, initial adoption possibly leading to more longer term maintenance) in influencing participation rates (124, 125). A more extensive description of stages and processes can be found in the application of the trans-theoretical model for behaviour.

The Trans-theoretical Model

The transtheoretical model has its origins in cognitive and social learning constructs and was utilised in health areas such as smoking, weight control and psychotherapy (126). A core construct of the model is a sequence of stages along a continuum of behavioural change. These stages have been labelled: precontemplation (do not intend to change), contemplation (intend to change), preparation (have made some change), action (actively engaging in a new behaviour), and maintenance (sustaining change over time).

A second core construct of the model looks at the processes which individuals use as they move through stages of change. Prochaska and colleagues (127) ordered a number of these processes into two higher order constructs namely, experiential and behavioural. Research has shown that experiential processes are more important than behavioural processes for understanding progress in the early stages of change and conversely, behavioural processes are more important for understanding and predicting transitions from preparation to action and from action to maintenance (128, 129). There is little data on whether the processes which are involved in the cessation of negative behaviours such as smoking, are the same as those involved in the acquisition of positive behaviours such as physical activity (130). It is of interest nevertheless to consider the possible relationships between the interventions and these processes of change.

Early work on the transtheoretical model was applied to the field of physical activity in a variety of populations. Sonstroem (130) found that students who dropped out of an exercise class could be classified as those who intended to return and those who had no intention to resume exercising. In a study of older adults, Barke and Nicholas (131) found that the stage of change effectively distinguished groups of older adults who differed in level of physical activity. More recently, Marcus and colleagues (132) undertook a large study of workplace employees and found that the pattern of the processes of change were indeed different from those involved in the cessation of smoking. Marcus and Simkin (133) examined the validity of the stage of change questionnaire by comparing it with a seven day recall of physical activity questionnaire. Scores on physical activity behaviour items significantly differentiated employees among the stages of change. In an intervention study, Marcus and colleagues (134) were able to demonstrate that use of a stages of change framework in both the design and conduct within the intervention, enhanced exercise adoption.

King and colleagues (37) summarised the model by stating that it could identify individuals who were in a 'ready state' and thereby help to tailor programmes appropriate to these individuals. In a more detailed analysis of the model, Biddle (122) concluded that the research base was weak, assumptions were made in matching appropriate interventions to individuals at different stages and that the processes of change in exercise is unknown. On the positive side, Biddle agreed with King and colleagues in the model's ability to identify important factors differentiating individuals in varying levels of change and that support for the model has been found in two countries. More tellingly, one further advantage in the model lies in its ability to provide a practical approach for recruiting sedentary individuals to physical activity interventions.

2.8 Dependent variables

The dependent variables in the research were physical activity and psychological well-being. The choice of a suitable measure to detect changes in physical activity levels was decided with due caution.

Measurement of physical activity

People are active in different ways, at various times, at numerous locations and for different reasons (64). The pattern of activity for each individual is different, and within individuals, the pattern of activity will fluctuate from day to day, and from week to week. It is also apparent that there is a distinct seasonal pattern to overall physical activity levels (135). Activity can also refer to a broad span with variation in mode (type), intensity, duration, frequency and intermittency. Physical activity is therefore a complex behaviour and a number of decisions have to be made as to how and what to assess. The selection of the physical activity measure was therefore carefully considered. Earlier researchers highlighted the difficulty of coding a wide range of physical activities to achieve energy expenditure values (136, 137). More recently, a number of authors have commented on the difficulty of accurate assessment in adults in a free living populations (64, 138-143). As Davis pointed out (140), whilst numerous methods of assessing physical activity exist, all such techniques have advantages and disadvantages and none is satisfactory. One of the world's leading authorities in the area of physical activity measurement concluded that it is extremely difficult to obtain reliable data about habitual levels of physical activity in any large sized population as there is disagreement as to what constitutes a consistent level of physical activity (139).

The criteria for choice of assessment tool must account for a number of important factors. It must be practical, have limited interference with subjects (where the actual process of completion does not alter natural or intended physical activity behaviour), be of low cost, be able to detect changes in the variables under study and provide quantitative data for analysis (63, 142).

Methods of assessment can be divided into objective and subjective forms. The objective forms of measurement include heart rate monitoring and electrical/ mechanical means, for example in the use of a pedometer. Assessment of physical activity by direct method using electrical/mechanical means cannot discriminate between modes of activity and until recently could not measure water based activities (e.g. swimming). Moreover, they are more costly, rely on greater subject co-operation and are acceptable only for studies involving small numbers over a limited time frame (142, 144). Subjective methods are made up a variety of surveys: diaries,

logs, recall questionnaires, job classifications and quantitative histories. The time frames and specificity of these surveys vary enormously: from one weekend (136) to many years (34) and from a few general questions which provide a "global assessment" (144), to a wide range of specific questions on vigorous, moderate and low intensity forms of activity (145). Additionally, surveys have looked solely at leisure time physical activity (146); others have focused on total physical activity to give an estimate of overall energy expenditure (63, 144). Leisure time physical activity surveys have been utilised due to the increasing sedentary nature of occupational tasks (139) the increasing availability of leisure time and for large sections of the population (older people and the unemployed), it is the only opportunity for physical activity (147).

Physical activity measurement by recall procedures are among the most pragmatic in free living adult populations (64) though there have been few attempts to examine the validity and reliability of these measures (147). To reduce bias in recording, recall methods are generally interviewer administered to probe for specific activity more completely and to help subjects estimate the intensity of various activities more accurately. The Minnesota leisure time physical activity questionnaire (146), used in eighteen published studies has established itself as the most popular physical activity questionnaire (138). This questionnaire was designed to obtain information about patterns in leisure time activity over the previous year i.e. a measure of habitual physical activity. A reduced time interval, the seven day (7d) recall, provides a measure of *recent* or *current* physical activity. Sallis and colleagues (142) have suggested that though the 7d recall may be an unstable estimate of habitual physical activity, it may be sensitive to changes in physical activity patterns and thus be suitable for lifestyle intervention studies. It has been found that several days of dietary records are needed to obtain stable estimates of nutrition (148). Since physical activity varies from day to day several days of record are needed to provide a representative sample (63). Gretebeck and Montoye (149) reported that at least five or six days were required and that weekdays and weekend days had to be included. Lamb and Brodie (147) presented a strong case for a two week recall (the Liverpool leisure time physical activity questionnaire) though other research has questioned the ability of humans to accurately recall data over this time period (141). Recall measures are affected by cognitive and cultural limitations. In the former case, the ability to accurately recall intensity and duration of physical activity has already been noted. In the latter case the definition of physical activity should be broad enough to account for the different perceptions of physical activity. Wimbush (150) noted one area of weakness in survey methods which assess leisure time physical activity. If physical activity is perceived as exercise and sport then many areas of working which

women traditionally are involved (e.g. household cleaning and caring for relatives) remain unacknowledged. Such survey tools will tend to bias the classification of women as 'sedentary'. Thus the questionnaire should be conducted initially within an interviewer structure where careful advice and sensitive probing by the interviewer can be administered.

Methods of scoring the recall questionnaire have attempted to calculate physical activity in relation to energy expenditure values. Literature is available on the energy expenditure expressed in METS (1 MET is equivalent to the energy expenditure of sitting at rest and is given in values of kcal/day or kcal/kg/day) of a large number of physical activities (151). It is well established that, at least for physical activity involving movement of body weight, there is a direct association between work intensity and energy expenditure via the body's metabolic processes (152). Ranges for different intensities are as follows: light activities are classed as 1-2.9 METS, moderate activity as 3.0-5.0 METS, hard activity as 5.1-6.9 METS and very hard activity as $\geq$7 METS. As a general indicator, brisk walking at 3.5 mph (5.6 kph) can be classed as a moderate activity whereas cycling at 8 mph (12.8 kph) is classed as a hard activity. Whilst the use of intensity coding (to produce a single value of energy expenditure) seems appealing for scoring a questionnaire, there are three major limitations. The use of basal resting-to-work metabolic rate for calculation of intensity codes is not exact, since basal metabolism is not consistent at 1kcal/minute. Secondly, there exists individual variation in the vigour of performing activities which can have a marked effect on the actual energy expended and therefore the intensity code value. Thirdly, some activities do not have intensity codes, making estimations necessary (63). Furthermore, Torun (153) has questioned whether the accuracy achieved with self report activity warrants the methodological sophistication of more precise MET energy expenditure assignments to individual activities.

There is a high degree of variability as to the known validity and reliability of recall questionnaires (154). There are two main reasons for this variability. Part of the variability lies in the criteria, typically cardiorespiratory fitness and body fatness, which are used as standards for testing the validity of physical activity questionnaires. Jacobs and colleagues (154) have stated that these measures reflect almost exclusively heavy intensity activity and should not be used as the sole validation standards. The other cause for the variability stems from the observation that different questionnaires can pick up different dimensions (light/moderate/hard/vigorous) of physical activity. However, Jacobs and colleagues concluded: "We know of no existing questionnaire that covers all these dimensions. The 7d day recall approximates full coverage of recent, not usual physical activity" (p88) (154). Studies of test-retest reliability of

questionnaires have found high correlation coefficients but it is still questionable whether the studies differentiate between the consistency of the questionnaire or the consistency of subjects' physical activity levels (138). Gross and colleagues (155) demonstrated that a brief structured training programme of interviewers increased the validity and reliability of the 7d recall questionnaire. In short, the 7d recall questionnaire undertaken in a structured interview, is apparently a valid method of measuring *current* physical activity and is particularly suited to detecting change in lifestyle interventions.

An adapted form of the 7d recall questionnaire (63) was used in this research to formulate a general, quantitative appraisal of leisure time physical activity. This adapted form did not attempt to formulate an energy expenditure value or approximate the total leisure time physical activity energy expenditure. The rationale behind the development of the questionnaire used in this research reviewed the relationships under investigation, the subjects involved, the practical constraints of time and cost, availability of research assistants and the type of information required.

Measurement of Psychological well-being variable

In keeping with the wide definition of health used in this research, a second dependent variable in the domain of psychological well-being was measured. Whilst a number of scales exist, they focus on the assessment of psychopathology and the identification of states of anxiety and depression (156). As Steptoe (21) has pointed out, the application of such measures to non-psychiatric populations may lead to floor effects, with scores being so low before intervention that the scope for further gain is limited. The Profile of Mood States (POMS) developed by McNair (157) and colleagues is better adapted for assessing affect in the general population and has been widely used in exercise studies (3, 158). The POMS questionnaire however fails to capture the positive feelings of well-being that are more than the mere absence of anxiety or depression. Moses and colleagues (22) have developed a psychological well-being questionnaire which consists of thirty six items. The questionnaire has three distinct dimensions: positive coping abilities or *coping assets*, perceptions of limitations in coping or *coping deficits* and perceptions of *physical well-being*. Each dimension has 14, 10 and 6 questions respectively.

2.9 Re-statement of Research question

Participation in regular physical activity has the potential to enhance the physical and mental health of the population. The levels of participation in physical activity however, remain very low in the adult population. The majority of past research in the physical activity field has tended to focus either on the risk of physical inactivity to ill-health or on the training effects of exercise participation; little is known about the effectiveness of interventions in various situations. Using a relevant and appropriate theoretical framework, sedentary adults were recruited to the research study to test the effectiveness of two physical activity interventions namely, fitness assessment and exercise consultation.

Chapter 3

Methodology

"No single item ...is more important than our advice to pilot all your procedures"

Research methods in physical activity
Thomas JR, Nelson JK
1990 (159)

Study 1
Focus Community Education Centre, Saltcoats
April 1992- July 1992

Introduction

The review of literature has suggested that it is important to discover which methods of physical activity intervention with sedentary adults are effective. In addition, it is postulated that attempts to change health related behaviours should be carried out within a positive or supportive environment. Study one was carried out at Focus Community Education Centre, Saltcoats. The aim of the study was essentially to pilot procedures and to appraise the feasibility of this type of research with sedentary adults.

Users of Focus community education centre in Saltcoats, North Ayrshire were invited to take part in the study. This location was chosen partly in relation to the need for exercise promotion in the area and partly due to practical reasons of proximity of travel for the main researcher (i.e. the author). Part of north Saltcoats is designated by Strathclyde Regional Council as a deprived area (160). Unemployment is high, there is little prospect of improvement in the job situation and there is a high proportion of young single mothers. Relatively few amenities serve this community with facilities lying to the south of the town, some twenty to thirty minutes walk away. The Centre was willing to provide a room for the project and staff were enthusiastic, agreeing to provide basic on-going administrative support. The Centre ran a supervised creche facility during the day thus allowing users (predominantly women) access to opportunities provided by the Centre.

The specific objectives for study one were:

(1) to examine methods and tools for recruiting sedentary subjects
(2) to develop an exercise interview
(3) to develop a fitness assessment
(4) to examine methods of monitoring change in physical activity levels
(5) to analyse findings.

The methodology and results of the preparatory study are described and the chapter is concluded with a discussion section.

Subjects

Sixteen sedentary female subjects (X=33 $\pm$ 8 years) who attended the Centre for classes took part in the study. No male subjects were recruited. Five subjects (31%) were regular smokers and 6 (40%) were overweight.

Instruments

Questionnaire

A 'Health Questionnaire' was drafted by the main researcher and pre-tested with colleagues and with other NHS staff[Appendix 1]. It was designed to recruit sedentary subjects to the study. Thirty one items in the questionnaire deal with medical history, general 'lifestyle' characteristics (smoking, dietary habits), and specific questions on sport, physical activity and exercise.

Fitness assessment

Morphological component

Using a set of weighing scales [Seca Personal Scale 760 Automatic Precision], weight was taken, then height, to produce a BMI score for body composition.

Cardio-respiratory component

Cardio-respiratory fitness or aerobic power was measured by estimating VO_{2max} from a submaximal workload on a bicycle ergometer [Monark 818]. The assessment method was based on one used by Blair and colleagues (161) in an exercise promotion study in a worksite setting. Subjects performed sub-maximally on a bicycle ergometer for a period of 9 minutes with incremental workloads at three minute intervals so that a steady state heart rate equivalent to 75% of maximum heartrate was reached. Initial test workloads were selected based on participants' gender, body weight and perceived global activity level - in general male subjects started at 50W and female subjects started at 25W. Incremental workloads were dependent on heart rate response at each stage. Pulse rate was taken by a heart rate monitor [Sport Tester 200]. The VO_{2max} was established from pulse rate regression on workload for subjects who completed the three stages. The regression line was extrapolated to age adjusted maximum heartrate and the estimated workload for that pulse rate was converted to oxygen uptake. This figure was then corrected for body weight.

Muscular component

a) Flexibility component

Subjects were asked to complete three repeat 'sit and reach' stretches. The type of equipment and standardised protocol is set out by Kibler (162).

b) Local muscular endurance

In measuring local muscular endurance subjects were asked to complete 'sit-ups' and 'press-ups', the format of which is set out by Kibler (162). A fixed time period of one minute however was set for both 'sit-ups' and 'press-ups'.

Exercise Interview

The exercise interview consisted of an opportunity to discuss and explore issues in relation to becoming more physically active on a regular basis. A pro-forma giving structure to the interview has been set out [Appendix 2]. The main areas for discussion included physical activity history, barriers to and existence of supporting mechanisms. Knowledge in relation to exercise for health was also assessed. A main component of the interview focused on the setting of short, medium and long term goals. The context of and outline to this exercise interview which has drawn on research from adoption and maintenance of exercise behaviour, has been explained elsewhere (60).

Dependent variable: leisure time physical activity

Subjects were asked to record leisure time physical activity in two formats:

i) Monthly diary: records of exercise, sport and habitual forms of physical activity were logged. Vigorous and moderate forms of physical activity were recorded with light household or DIY work e.g., washing dishes, 'hoovering', painting being excluded. The diary asked for information on i) mode ii) duration in hours and minutes per day [Appendix 3].

ii) Seven day re-call: similar to the above but subjects recalled leisure time physical activity over the previous week. Subjects were further asked whether the previous week was 'normal' with respect to type and amount of physical activity [Appendix 4].

A separate small scale study was carried out to test the reliability of the 7d re-call questionnaire (see Appendix 5) and data from a fitness assessment group was used to analyse the validity of the questionnaire (see Appendix 6).

Procedures

The main researcher attended an 'Open day' and a number of structured classes at the Centre. The purpose of the study was explained and invitations were extended to Centre users to take part. Individuals who took a questionnaire, returned it by stamped addressed envelope or handed in to a delivery box at the Centre. Ninety seven questionnaires were given out and fifty seven (59%) were returned. As no list was drawn up of who received a questionnaire, reminders were not sent out. From this sample of fifty nine returned questionnaires, the following respondents were excluded: ten on medical grounds (e.g., suffering from acute back pain, joint disease or on medication for coronary heart disease), three by age i.e. outwith a 20-60 years age band, three gave no contact address, three had gained employment and four subjects were found to be Centre staff. In addition, thirty seven respondents (76%)

classified themselves as moderately or very active and were therefore excluded from the study.

The remaining sixteen sedentary female subjects were randomly assigned to a fitness assessment or exercise interview group. The project timeframe spanned from April to July 1992. The main researcher carried out all the interventions. The purpose of the study was explained, subjects were assured that information relating to specific individuals would remain confidential and that subjects would be contacted three months later for recall.

Prior to the fitness assessment subjects filled out a physical activity readiness questionnaire (PAR-Q), a modified form of the one developed by the British Columbia Ministry of Health (59) [Appendix 7]. Indirect blood pressure measurements were taken using a Omron Automatic Digital Sphygmomanometer (HEM 705c). If a subject had a blood pressure over 95/150 (i.e. diastolic over 95 and/or systolic over 150) then the assessment did not proceed (163). Two subjects were transferred to the exercise interview group on the day of the intervention: one subject forgot to bring proper clothing and another subject appeared on the day suffering from a viral infection. Both subjects were offered and accepted an exercise interview. Therefore six subjects had a fitness assessment and ten subjects completed the exercise interview.

Component measurements for the fitness assessment were taken in the following order: body composition, cardio-respiratory endurance, flexibility and then local muscular endurance. Subjects in the fitness assessment group undertook a short two minute warm-up and familiarisation period on the bicycle ergometer and then completed the protocol for assessment of aerobic power. (If subjects felt considerable discomfort or heartrate exceeded age adjusted 75% of maximum heart rate, the procedure was stopped.) Subjects in the assessment group completed a 2-3 minute cool down at low resistance on the bicycle ergometer. In the case of muscular endurance component, subjects were advised not to hold their breath and to discontinue should they experience considerable discomfort. Results were transferred to a fitness assessment pro-forma [Appendix 8]. Feedback was given to each subject and their measures of fitness, where appropriate, were discussed in relation to norm tables. In this way subjects were told whether they were below, at, or above a norm score for their gender and age.

In the exercise interview, the interviewer led the subject through a number of areas for discussion as set out in the interview pro-forma described above (see Appendix 2).

Due to lack of space at the Centre, the room which was used for fitness assessment had to be used for the interview; this arrangement resulted in rather cramped conditions. Whilst the interviewer structured discussion along the guidelines set out in the pro-forma, subjects were encouraged to raise any issue which they thought was important. The interviewer explained to subjects that brief notes would be taken throughout the interview but that information would remain confidential.

An information pack containing a directory of local authority leisure provision, the *Exercise -Why Bother ?* and the *Exercise for Life* booklets were given out to subjects in both interventions. At this stage subjects also received their first monthly exercise diary. Completion of monthly diaries was explained and subjects were encouraged to be both accurate and honest. No extrinsic reward system was used to maximise return rate. With respect to the re-call, subjects were informed that they would contacted at around a ten week period. Subsequently, subjects received two monthly diaries through the post at monthly intervals.

Around three months later, participants were recalled to the study. Subjects had a follow-up fitness assessment or exercise interview and were encouraged to provide feedback on the monthly diary and 7d re-call or indeed any aspect of the project. Participants were asked to fill out a seven day recall form for the week prior to day of the recall.

For ease of analysis the monthly diaries were divided into blocks of seven consecutive days giving a maximum of twelve potential data points. Actual time is recorded in blocks of at least ten minute intervals, thus cutting down the need to recall all physical activity. Results are given in decimal points e.g., 5hrs 10 mins is given as 5.16.

Results

It is difficult to carry out statistical analysis on so little data and as such, no statistical conclusions can be drawn. However, some of the data in relation to changes in physical activity levels is described. Some aspects of qualitative analysis in relation to feasibility and validity of the instruments and procedures are described and further explored in the discussion section. General recommendations are then made for inclusion to study two.

Administration of procedures

Completion of the PARQ involves around one minute to undertake. The fitness assessment protocol takes around forty five minutes to complete whereas the exercise

interview takes around thirty minutes. It was difficult to assess the amount of time that subjects took to complete the monthly diary as some subjects forgot to enter data on an on-going day to day basis; two subjects expressed their unwillingness to complete the diary. The seven day recall takes in the region of 5-10 mintues to complete.

From Table 3.1, it can be seen from the returned questionnaires that thirty two per cent were classified in the 'very active' category, forty four per cent as 'moderately active' and just under a quarter of respondents were categorised as 'lightly active'.

Table 3.1 Self reported physical activity status of respondents to 'Health questionnaire'.

Activity status	Very active	18 (32%)
	Moderately active	25 (44%)
	Lightly active	16 (24%)

Table 3.2 shows that age and smoking status characteristics of the subjects did not differ markedly from respondents. Six subjects (40%) were classified as overweight in line with 46% overweight from all respondents. The age and gender distribution from the returned questionnaires accurately reflected user demographics of the Centre (164).

Table 3.2 Comparison of subjects to respondents from 'Health questionnaire'

	Respondents			**Subjects**	
Sex	Female	52	(91%)	16	(100%)
	Male	5	(9%)	0	(0%)
Age	X = 37±14 yrs			X = 33±8 yrs	
Regular Smoker†	22		(38%)	5	(31%)
Overweight ‡	26		(46%)	6	(40%)

† regular smoker - more than one per day
‡ overweight - Body Mass Index > 25 (165)

Table 3.3 shows that only two out of six in the fitness assessment group compared to eight out of ten in the exercise interview group returned most, or all diaries. Four subjects in the fitness assessment group and nine subjects in the exercise interview group returned for recall.

Table 3.3 Physical Activity by Monthly Diary and 7d re-call.

Exercise Interview (EI)		
Subject (hrs)	Monthly Diaries (hrs)	7d recall
EI1	nil return	3.0
EI2	7.16,6.25,3.25,4.25,7.08,6.25,9,5.16,5.08,4.25,3,7.25	5.83
EI3	7.58,8.16,3.25,2.40,6,5.32,1.64,1,1.32,1.32,	1.5
EI4	5.83,7.25,5.40,4.74,7.5,7.16,8.25,3.92,5.92,2.83,3.75	6.08
EI5	4.25,6.64,3.40,4.75,4.08,5.92,2.40,6.32,7.25	0.00†
EI6	6, limited completion	dna
EI7	4.75, limited completion	13.32
EI8	7.32,4.64,2.64,1.83,5.16,7.08,6.25,6.5, limited completion	13.58
EI9	nil return	3.16
EI10	10,8.4, limited completion, 11.16,6.5,11.16,8.64	6.0
[†Subject EI5 had severe athritic problems]		
Fitness Assesment (FA)		
Subject (hrs)	Monthly Diaries (hrs)	7d recall
FA1	3,3.92,4.16,2.83,7,5,1.75,1.32,1.64,1.75,1.75	3
FA2	nil return	dna
FA3	17.5,15,11.32,10.92,16.64,9.25,9.5, limited completion	2.92
FA4	nil return	2.83
FA5	nil return	1.25
FA6	nil return	dna
[dna - did not appear for recall]		

Changes in physical activity by monthly diaries and 7 day (7d) recall

Figures 3.1 and 3.2 show week by week plots of physical activity levels of six subjects in the exercise interview group and two subjects from the fitness assessment group. These subjects provided adequate data for this purpose; the remaining subjects either partially completed or failed to return diaries. These figures also plot 7d re-call from the post-test for subjects who completed a 7d recall questionnaire. There is a general cyclical pattern to physical activity participation with considerable fluctuation of physical activity levels from a week to week basis. Correlation between 7d recall and the last week of entry in the monthly diary yielded a cofficient of 0.3; however,

when subject EI5 was removed from the analysis (this subject had suffered from a bout of acute arthritis whose 7d total was 0.00hrs) the coefficient rose to 0.8 though not reaching significance at 0.05 level.

Figure 3.1 Plots of weekly totals of PA (hr.wk^{-1}): Exercise interview subjects

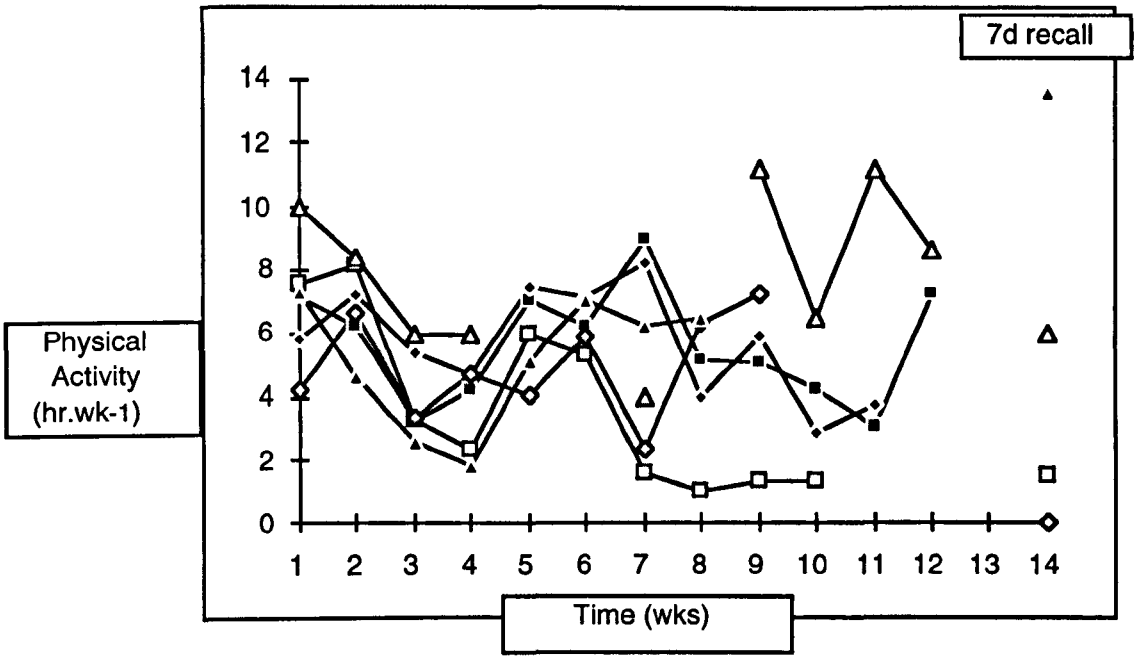
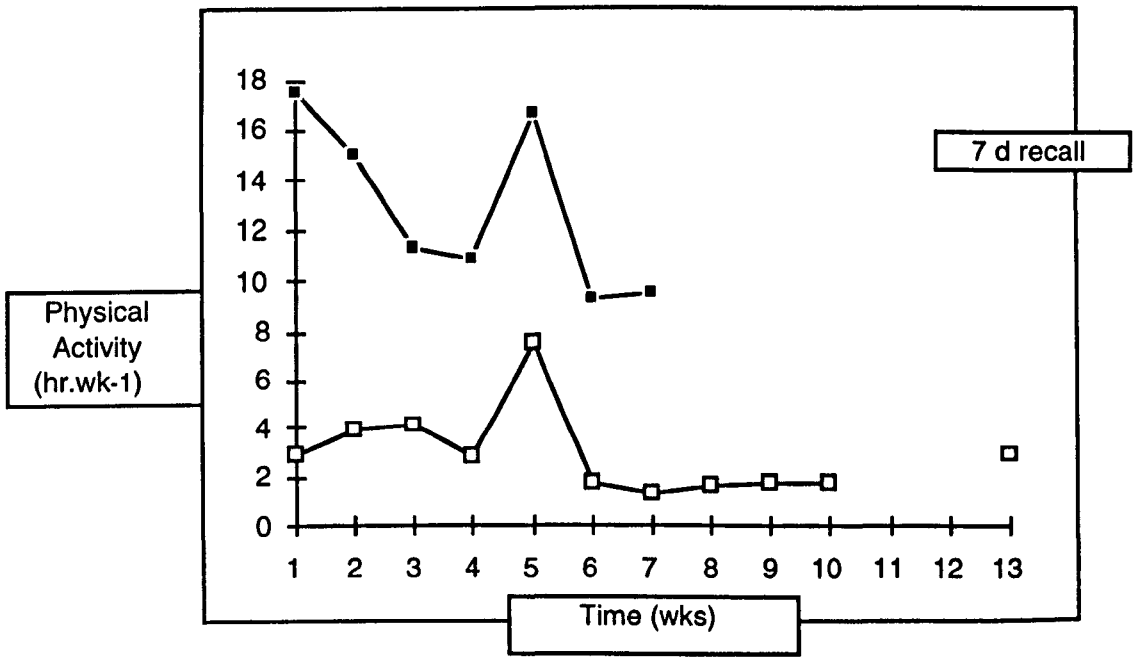


Figure 3.2 Plots of weekly totals of PA (hr.wk^{-1}): Fitness assessment subjects



Subjects' responses to use of monthly diary provides was varied. From discussion with subjects at post-test, it seemed that the 7d re-call was preferred in comparison to

the monthly diary. Furthermore, it seemed that the diary was not filled in on a day to day basis but from recall.

Discussion

The results from the preparatory study are limited. Due to local demographics small numbers were probably inevitable; stringent exclusion criteria further reduced numbers. As stated in the introduction to this chapter, the main objectives were process oriented i.e. to examine the methods and tools for carrying out research of this nature with sedentary subjects in a 'free living' situation rather than the effects of an intervention *per se*.

With respect to physical activity level possible comparisons can be made to two studies. An Ayrshire study of coronary risk factors showed that 13% of women in the 20-59 age group took regular vigorous exercise in leisure time (33) . A larger national study, though with women in a later age bracket (40-59 years), showed that 10% were regularly physically active in strenuous activity during leisure time (86). The percentage of women who were smokers is in line with national norms (87). The percentage overweight was actually lower than local norms (86).

In quantitative terms, data from monthly diaries was poor - they were only partially completed or not returned. As the diaries were posted out, some subjects received their diaries at different times. This resulted in inconsistency as to the day on which subjects started the diary - the diaries are simply numbered 1-31, with no day 'title' (i.e. Monday to Sunday) to these numbers. Due to inconsistencies of start date and re-allocation of times for post-test, there was no way of ensuring that the last seven days of the monthly diary was identical to the seven days of the 7d re-call. Inevitably, this inconsistency confounded any attempt to look at the relationship between the monthly diary and the 7d re-call. Subject EI5 in the interview group shows this point very clearly. The last week of the monthly dairy gave her physical activity level at 7.25 hours yet her 7d recall level was 0.00 hours.

From the plots of the reported levels of physical activity over the three month period, there seems to be more of a cyclical nature to the variation and a large variation amongst subjects than any steady increase in level of physical activity over time. From this data it is difficult to conclude whether any change, positive or negative, in physical activity levels had occured. A study of Scottish adults by Uitenbroek and McQueen (135), using a telephone interview method, found little evidence for seasonal fluctuation in physical actvity though did show that women are more likely to consider losing weight in the spring rather than at any other time of the year.

These authors reported that there was very little research in the field of seasonality with respect to exercise behaviour. If seasonal fluctuation in physical activity level does exist then timing in relation to choice of month in the year for pre- and post test might prove crucial in determining overall levels of physical activity for all subjects irrespective of intervention. In other words, all groups could decrease overall levels of physical activity over time. Perceived drop in physical activity by subjects may well have a important bearing on their decision to return for post-test. The more obvious obstacle such as annual holidays would have a direct influence on ability to attend pre- and post dates. It is recommended therefore that the timing of the study two's pre- and post test bear in mind potential seasonal fluctuation in overall physical activity level.

Internal Validity

i) control group

Study one lacked a control group thus limiting any potential to conclude that positive change was attributable to an intervention as opposed to 'local' effect. It is recommended that a control group be included in the study two.

Whilst the perennial problem of self selection will remain, it was felt that subjects should have been randomly selected from a mailing list of all centre users in the first instance. In this way the system for recruitment at least would have been more equitable. It is recommended that a whole sampling frame be approached in studies two and three.

ii) sample size

The small size of sample has already been documented. In order to reach a larger potential sample of subjects a number of community centres would have to have been considered. Ayrshire and Arran has well dispersed communities which would have presented the main researcher with considerable problems. Apart from the increase in time and cost there is a more important drawback. By having a number of sites there is a strong case that change in behaviour may be due more to the different ethos and developmental stage of each community centre than to the intervention itself. Furthermore, by using a number of different sites, the administrative, personnel and resource cost implications would have come quite prohibitive. The workplace setting with NHS employees was chosen as the sampling frame in study two and three. The rationale for this decision was set out in chapter two.

iii) criteria for sedentary status

Drawing heavily from examples in epidemiological studies, the 'health questionnaire' was risk factor oriented and asked for information that was not wholly relevant to the specific objectives of the research project. Chapter two outlined in detail the complexity of measuring physical activity. The measurement issue is a crucial one in the research as subjects are supposedly *sedentary*. The questionnaire asked subjects about their habits in relation to sport, exercise and habitual physical activity. It attempted to separate subjects into three categories namely, 'very active', 'moderately active' and 'lightly active'. From Table 3.1, it can be seen from the returned questionnaires that a fairly high figure was observed in the 'very active' category, slightly less than half were categorised as 'moderately active' and just under a quarter of respondents were categorised as 'lightly active'. Participation levels in vigorous exercise as measured by the Scottish Heart Health Study in Ayrshire and Arran revealed much lower figures (33). There is no agreed formula for combining different levels of physical activity. For example, should an individual who is lightly active in walking and lightly active in exercise be classified as moderately active? Similarly, is an individual who is moderately active in exercise and moderately active in sport, vigorously active? The questionnaire attempted to address this concern (see Appendix 1) but summation of physical activity at differing intensity levels is at present an inexact science. In the light of the above and subsequent reading of the literature, the questionnaire was replaced by a 'Stages of Change' questionnaire in study two and three.

iv Statistical analysis

Two subjects in the fitness asessment transferred on the day to the exercise interview. Whilst this may be acceptable for administrative purposes, the random allocation of subjects to intervention group would be compromised. It is recommended that any subjects who is transferred from one intervention be removed from statistical analysis.

Screening Measures

The taking of blood pressure by indirect method i.e using a cuff and ausculatory readings of the Kototkoff sounds is both simple and safe. There is also good correlation between direct and indirect measures of systolic blood pressure at rest (166). However, whilst the taking of blood pressure is a valid procedure for screening of hypertension, there is no clear rationale for taking this measure as opposed to the taking of other screening measures such as diabetes or asthma. The taking of blood pressure was therefore discontinued. The use of the Physical Activity Readiness Questionnaire (PARQ) as a general screening measure was retained and used for both the fitness assessment *and* the exercise interview groups.

Fitness assessment

Upper body muscular endurance is generally a neglected area of fitness. In the fitness assessment, only two subjects could manage 'press-ups' and three do 'sit-ups'. The importance of this component of fitness was therefore explained in the first instance; thereafter, each exercise was demonstrated to them in a format which involved less physical demand. Reference was made to the booklet *Exercise - Why Bother ?* which contained demonstrations of modified 'press-ups' and sit-ups'. There are additional considerations to bear in mind in this context. All tests of muscular endurance are highly specific and are difficult to standardise in non-laboratory conditions. In terms of specificity, subjects may increase other areas of muscular endurance but fail to show any marked improvement in 'press-ups' and 'sit-ups'. The one minute maximum requires considerable physical effort and may not be suitable for a health related physical assessment. The choice of measures to assess local muscular endurance would be critically reviewed in study two.

Exercise interview

In keeping with general counselling principles (167), the format in the exercise interview was modified whereby the heading 'knowledge' was removed as a prompt in the pro-forma. In this way the topic would be brought up by the subject within the interview. The term interview however, has a number of negative connotations and would undoubtedly influence a subject's perception of the process. The term exercise consultation is used in studies two and three.

Dependent Measures

Measurement of change in leisure time physical activity.

The diaries record total time (in hours and minutes) of physical activity - the question of intensity of exercise is an important one but in the context of this research was simplified by asking subjects to record only types of physical activity which were moderate or vigorous. Subjects were advised to exclude certain activities e.g. hoovering, polishing and general cleaning from the diary or 7d recall. This was done on the basis that these activities are general household ones and that they would be done as a matter of course as distinct from *additional* levels of physical activity participation.

The accuracy of the monthly diary if completed by recall is called into question. Five out of ten diaries in the interview group were only partially completed. The monthly diary, if returned, could provide information on trends whereas only specific time points are needed for the study. It was recommended that the monthly diary be

discarded in favour of the seven day recall measure and that methods are considered which will assist in the return of forms between pre- and post test.

Environment

The same room was used for the fitness assessment and the exercise interview. The latter intervention requires a basic room which is quiet and uncluttered with fitness assessment equipment. It was recommended that separate rooms be sought for the further studies.

Dependent variable - Psychological well-being

At this stage of development in the research it was thought that the measurement of self reported change in physical activity whilst suitable as an dependent variable could be complimented by an additional dependent variable which addressed the psychological dimension to activity and well-being. The second and third study included a questionnaire on psychological well-being.

Study one enabled the main researcher to critically appraise methodology for the recruitment of subjects to a health related exercise study. The independent variables i.e. an exercise consultation and a fitness assessment were refined for application in a study of adults in a 'free-living' situation. The choice of the 7d recall physical activity questionnaire as a tool to measure the dependent variable of physical activity was examined in more depth and further refined.

Chapter 4

Study 2:

Ayrshire Central Hospital, Irvine
September 1993 - March 1994

Introduction

Study two was undertaken with employees of North Ayrshire and Arran NHS Trust.at Ayrshire Central Hospital in Irvine, a non-emergency hospital site. The general aim of this study was to compare the effectiveness of exercise interventions in a larger sample and further develop procedures and instruments from study one. The specific objectives were as follows:

to take account of findings from the preparatory study
to devise efficient methods for contacting a large sampling frame
to improve appropriate tools to recruit sedentary staff
to improve appropriate tools to monitor change in dependent measures
to consider methods of intervention between pre- and post test
to devise a training programme for research assistants
to analyse data.

The methodology of study two is described and results are then analysed. The chapter concludes with a discussion of the findings and recommendations for study three.

Subjects

One hundred and nineteen sedentary subjects (X= 39.4 $\pm$ 9.6 years) who were employees of North Ayrshire and Arran NHS Trust took part in study two. One hundred and twelve subjects (94%) were female and seven subjects (6%) were male. Staff were classified as sedentary if they did not fulfil the criteria for regular physical activity as set out in the 'Stages of Change' questionnaire [described below under 'Instruments']. Of the one hundred and nineteen subjects, forty one (21%) were classified as 'contemplators' and one hundred and fifty one (79%) were classified as 'preparers' in the questionnaire.

Instruments

Questionnaire

A stages of change questionnaire was devised which aimed to identify sedentary NHS staff as potential subjects for the study two [Appendix 9]. The questionnaire asked staff about physical activity specifically in their leisure time. Staff were classified as sedentary if they did not meet the following criteria for regular physical activity: participation in exercise or sport at least 2-3 times per week and/or being physically active (e.g., gardening, walking) for at least 15 minutes for 4-5 times per week.

Fitness Assessment

With the exception of the removal of blood pressure measurement the basic structure to the assessment was identical to study one. A small number of textual

ammendments were made e.g., a standard comment section for each fitness component was added to remind assessors to explain to subjects the importance of each area of fitness [Appendix 10].

Exercise Consultation

The pro-forma dropped the section relating to knowledge of health related physical activity and was re-titled exercise consultation in comparison to study one [Appendix 11].

Independent measures

i) Seven day recall of leisure time physical activity questionnaire (7d re-call)

An information sheet was devised to help subjects complete the form [Appendix 12].

ii) Psychological well-being

A psychological well being questionnaire as described in Chapter two was used as an additional dependent measure[Appendix 13]. As each question is scaled on a 5 point scale (0 to 4), the coping assets score can range from 0-56, coping deficits from 0-40 and physical well being from 0-24. A decrease in deficit score signified a positive response in subject's well being.

'Customer satisfaction' questionnaire

A short questionnaire was devised to gain feedback on a range of aspects relating to the procedures of the fitness assessment and exercise consulation interventions [Appendix 14]. This questionnaire also contained one question on intention to begin or increase levels of physical activity and an open section for comments.

Procedures

A 'Stages of Change' questionnaire was distributed via the internal mailing system to twelve hundred and ten staff of North Ayrshire and Arran NHS Trust based at Ayrshire Central Hospital, Irvine. Five hundred and ten were returned giving a response rate of 42%. The Personnel Department of the Trust supplied the main researcher with individually addressed labels thus easing the administrative workload. Staff returned the questionnaire using the same mailing system. Secretarial assistants working on the exercise project then attempted to contact all those staff who were in the contemplation and preparation stages of change. At least two attempts were made to contact such staff. The pre- and post test parts of the study took place in September 1993 and March 1994 respectively. The interventions were carried out during normal working hours i.e nine a.m. until five p.m. It took two weeks to complete both pre- and post test phases of study two. Subjects were randomly

assigned to one of the three intervention groups. When the nature and time commitment of the study was explained to potential subjects, some subjects in the information group (especially those who were on night duty and lived some distance away from the hospital), expressed unwillingness to return to the hospital for such a short time period. Seven subjects who were in the information group declined to take part and a further nine subjects who were originally assigned to this group were randomly re-assigned to either a fitness assessment or an exercise consultation. The final figures for subjects in study two were as follows: forty five were assigned to fitness assessment, forty eight to exercise consultation and twenty six to information only.

Allocation of work to research assistants

Two research assistants were employed to help carry out the fitness assessments and the exercise consultations. A training day was organised for these assistants to familiarise them with the research protocols. The content of the training day is outlined in Appendix 15. Subjects in the information only group were seen by the main researcher.

All subjects were initially asked to complete a psychological well-being questionnaire. The research assistants assisted subjects by explaining how to complete the questionnaire. The Physical Activity Readiness Questionnaire (PARQ) was completed by both the fitness assessment and the exercise consultation groups. At the end of the intervention all subjects were asked to take away and complete a 'Customer satisfaction' questionnaire; this questionnaire could remain unsigned.

All subjects received a free T-Shirt if they completed and returned the 7d recall questionnaire at a four week interval. A newsletter was distributed via internal mail to all subjects at a three month interval to encourage them to maintain any positive change and to return a further 7d recall questionnaire [Appendix 16].

For the recall two different research assistants were employed with one assistant seeing all fitness assessment subjects and the other seeing all other subjects in the exercise consultation group. The main researcher saw subjects in the information only group. Subjects completed questionnaires for both the dependent measures of physical activity and psychological well-being. Letters via the internal mail system were sent out to all subjects who did not attend the recall. Non-attending subjects were asked to complete and return a well-being questionnaire and a 7d recall physical activity questionnaire.

Results

The distribution of staff to the five categories of stage of change can be seen in Table 4.1. The spoiled category included questionnaires returned as sent, subjects ticking more than one box relating to stage of change and subjects who did not tick any box relating to stage of change.

Table 4.1 Distribution of staff [N=509; 1 missing value] to stage of change .

Stage	category	count	%
0	'spoiled'	32	6
1	pre-contemlation	16	3
2	contemplation	41	8
3	preparers	151	30
4	action	45	9
5	maintainers	224	44

Of the one hundred and ninety two staff who were in the contemplation and preparation stages, one hundred and nineteen staff eventually took part in study two. The main reasons for loss in numbers were, inability to make contact (rotating/ irregular shifts, patient care priority), night shift staff unwilling to give up time during the day. Other reasons included staff turnover, staff no longer on site at the hospital and female staff at various stages of pregnancy.

Mean and standard deviation of respondents' age was 39.7± 10.3 years. Comparisons of subjects with the sampling frame i.e. total workforce at the hospital site in relation to age, sex and occupational status are given in Table 4.2. It can be seen that medical staff and males were generally under represented. The percentage returns for each category of change compares favourably with other research using a stages of change exercise questionnaire in a Scottish population (168).

Table 4.2 Comparison of returns to sampling frame for sex, age and occupational categories.

	Sampling frame (n=1210)	Returns (n=510)
Sex		
male	19%	9%
female	81%	91%
Age		
16-19	0.9%	0.6%
20-39	50%	49.5%
40-59	48%	48.7%
≥ 60	1.1%	1.2%
Occupation		
Domestic and ancillary	26%	23%
Administrative and clerical	15%	15%
Para-medical	11%	9%
Nursing	43%	52%
Medical	5%	1%

A comparison of the distribution of staff to the five stages of change categories in study two to other research (168, 169) can be seen in table 4.3. In a cross-sectional study of 1093 U.S. employees and 801 Australian employees, Marcus and Owen (169) found 41% of the sample in the combined categories of pre-contemplation and contemplation and 59% of the sample in the combined categories of preparation, action and maintenance. Study two with the other U.K. study found 79% and 83% respectively in the combined categories of preparation, action and maintenance.

Table 4.3 Percentage of sample in each stage in study 2 (a) and comparisions to other research.

	Research Figures in %		
Stage	(a)	(169)	(168)
[Unclassifiable]	6	-	13
Pre-contemplation	3	8	-
Contemplation	8	31	17
Preparation	30	20	14
Action	9	13	22
Maintenance	44	19	43

[(-) = no data]

A total of sixty nine 'Customer satisfaction' questionnaires were returned giving a response rate of fifty eight per cent. Table 4.4 shows scores relating to item 'Intention to change/increase levels of physical activity'. As scores ranged from zero (low) to five (high), subjects' mean scores were high for both the fitness assessment and exercise consultation.

Table 4.4 Distribution of scores and mean and standard deviation on item 'Intention to change/increase levels of physical activity'.

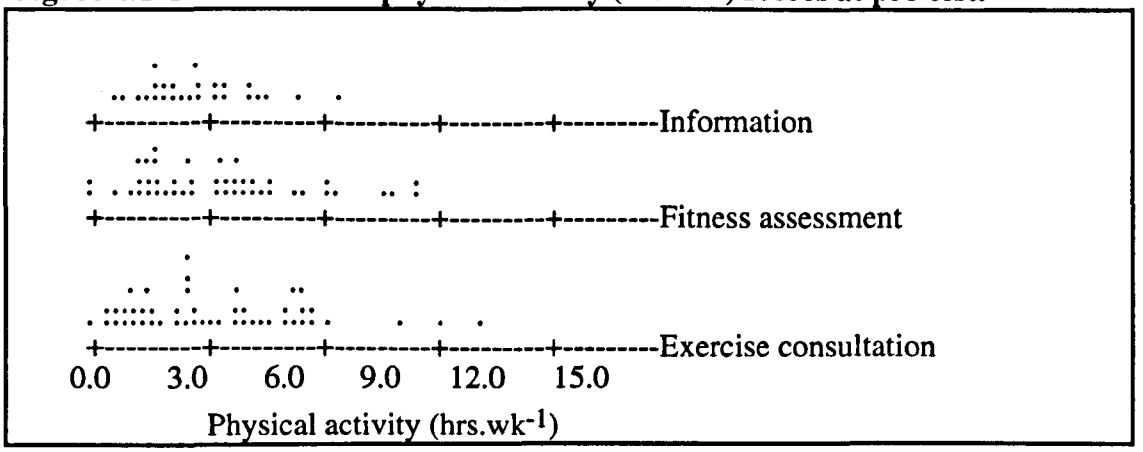
Score range	Fitness Assessment (36)	Exercise Consultation (33)
0	0	0
1	0	0
2	0	0
3	3	4
4	20	20
5	13	9
Mean± sd	4.3 ± 0.6	4.2 ± 0.6

Comments from the 'open section' in the questionnaire were generally very positive; subjects enjoyed the experience, found it worthwhile, appreciated the time spent with them and were impressed with the overall level of contact. Positive comments were equally distributed between exercise consultation and fitness assessment subjects. There were a few comments relating to the procedures for the intervention e.g., one subject commented that instructions to fitness assessment subjects should have included a note to bring a towel and another in the exercise consultation wanted more

time to discuss matters. There were two requests for more information on 'dieting' and one negative comment on the value of funding this type of study in the NHS.

Figure 4.1 shows the distribution of physical activity scores for all subjects in each of the three intervention groups. All plots revealed a normal distribution but with slight positive skewness in each case.

Figure 4.1 Distribution of physical activity (hr.wk^{-1}) scores at pre-test.



Twenty four subjects in the fitness assessment group (53%) returned for post-test, thirty one (64%) for the exercise consultation and seventeen (65%) in the information group. The return rate of questionnaires from non-attending subjects can be seen in table 4.5. Data from subjects who attended at recall and subjects who did not attend but returned the questionnaires were grouped together. There is data therefore on thirty five subjects in the fitness assessment, forty one subjects in the exercise consultation group and twenty two subjects in the information only group. A chi-square test was carried out on post-test drop-out [$Chi^2 = 3.45$ $2df$; ns (critical value 5.99 at $p<0.05$)] and return rate from postal questionnaires [$Chi^2 = 2.05$ $2df$; ns (critical value 5.99 at $p<0.05$)] revealed no significant differences.

Table 4.5 Attendance and postal return rate at post-test

Intervention	Pre-test	Post-test	Returned questionnaires
Information only	26	17	5
Fitness assessment	45	24	11
Exercise consultation	48	31	10

Leisure Time Physical Activity

Mean and standard deviation scores of leisure time physical activity at pre-test are seen in table 4.6. Staff who were classified as 'contemplators' and 'preparers' were

involved in around four hours of physical activity per week. At least two subjects had a score of zero whilst one subject had a score of just over fourteen hours. Analysis of variance of pre-test scores as seen in Table 4.7, showed no significant difference amongst the three groups.

Table 4.6 Physical activity measures (hrs.wk^{-1}) at pre-test.

	N	MEAN	MIN	MAX	STDEV
Information	26	3.9	1.0	9.0	1.9
Fitness assessment	45	4.7	0.0	11.8	3.0
Exercise consultation	48	4.6	0.0	14.1	3.2

Table 4.7 Difference in physical activity (hrs.wk^{-1}) between groups at pre-test.

SOURCE	DF	SS	MS	F	p
FACTOR	2	10.03	5.02	0.61	0.547
ERROR	116	960.64	8.28		
TOTAL	118	970.67			

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+---------+---------+---------+-
Information	26	3.945	1.925	(----------*----------)
Fitness Assessment	45	4.697	2.980	(---------*---------)
Exercise consultation	48	4.580	3.187	(---------*---------)
				-----+---------+---------+---------+-
POOLED STDEV =	2.878			3.20 4.00 4.80 5.60

Plots were made for each intervention group with the difference between the second measure (i.e. at four weeks) and initial score against initial score. Figures 4.2 to 4.4 show the relationship between subject's change in physical activity at four weeks plotted against subject's initial score. A negative gradient exists: the higher a subjects' initial score the less likely a subject is of increasing that score at four weeks. Subjects whose initial physical activity levels were greater than 3.5 hours per week were analysed separately.

Figure 4.2 **Physical activity scores: difference at 4 weeks v initial score Information subjects.**

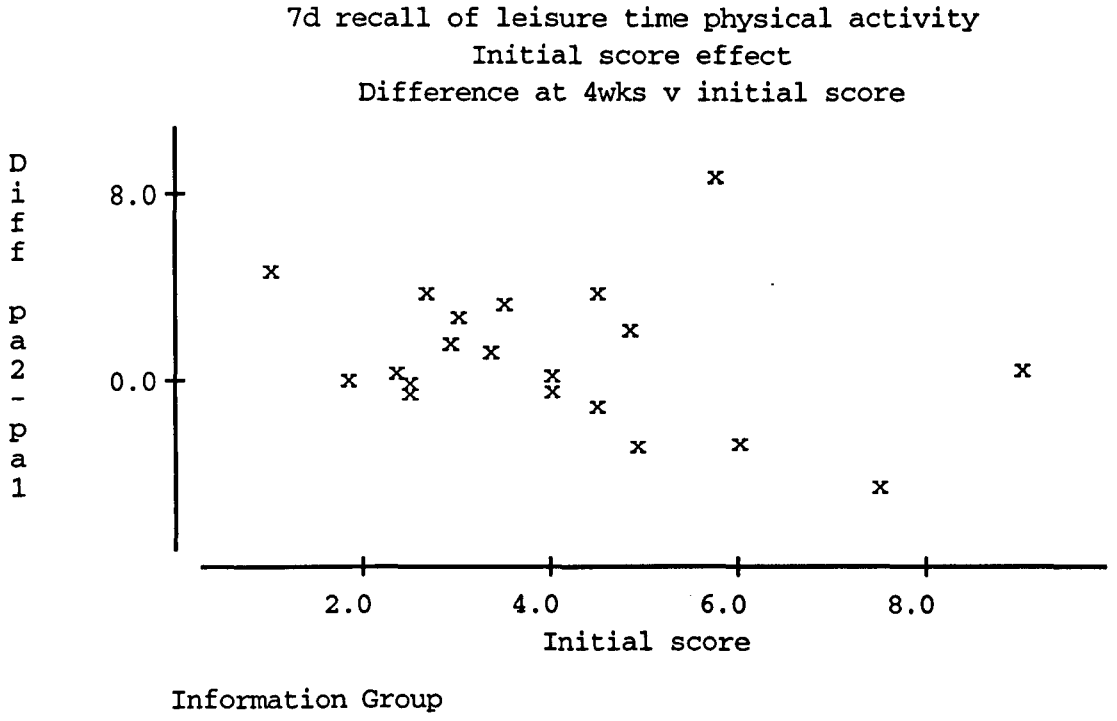


Figure 4.3 Physical activity scores: difference at 4 weeks v initial score
Fitness assessment subjects

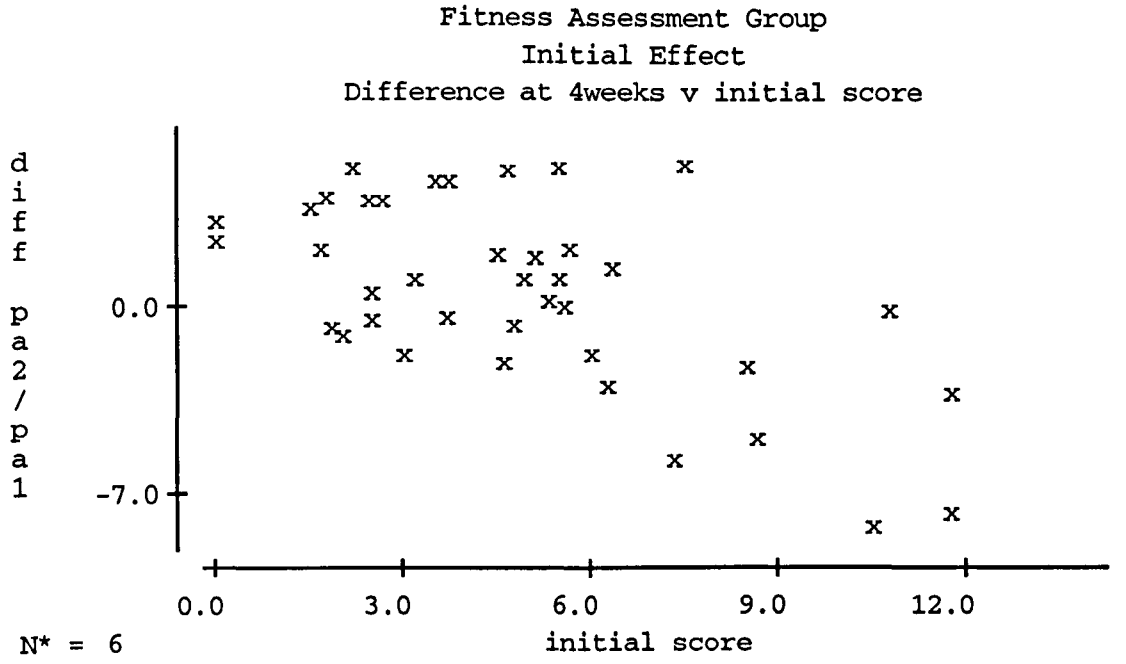
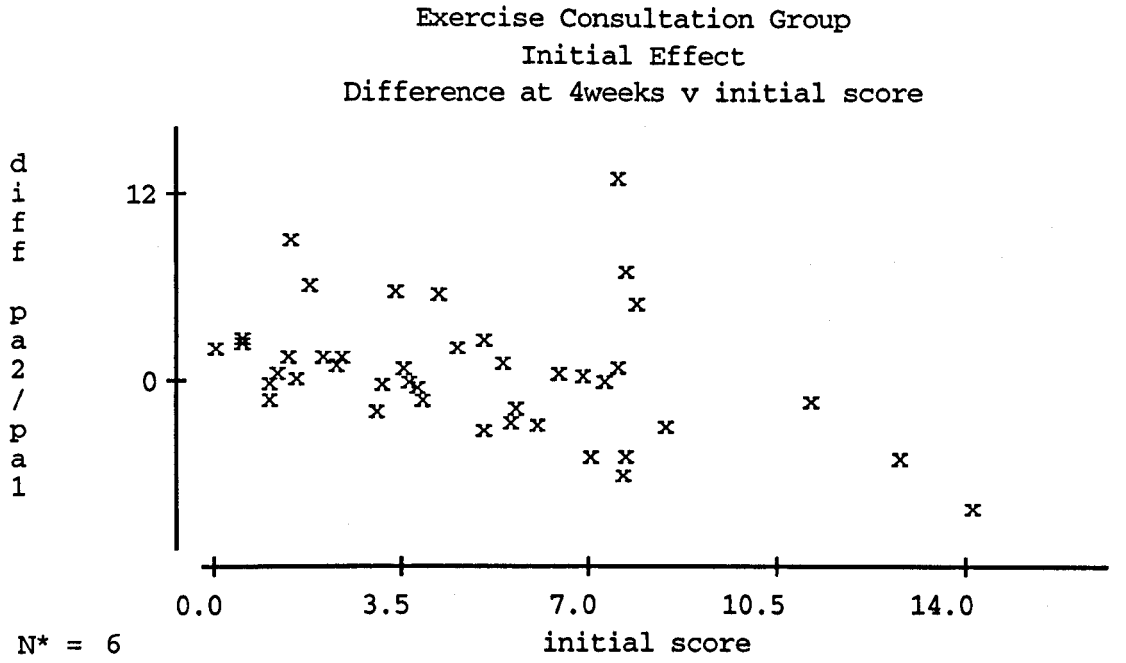


Figure 4.4 Physical activity scores: difference at 4 weeks v initial score Exercise consultation subjects



[Note: n relates to missing values]

Return of 7d recall questionnaires at three months was low: fourteen subjects (40%) in the information group, eighteen subjects (40%) in the fitness assessment and seventeen subjects (35%) in the exercise consultation group returned diaries. This data was therefore not included in the analysis. The mean and standard deviation physical activity scores of subjects by stage of change then in combined form are given for pre-, four weeks and post test in physical activity (Tables 4.8 - 4.10). The mean and standard deviation for psychological well-being scores are given in Tables 4.11-4.13 for coping assets, Tables 4.14-4.16 for coping deficits and Tables 4.17 - 4.19 for physical well-being.

Table 4.8 **Physical activity (hr.wk^{-1}) at pre-test, four weeks, three months and six months post test (Mean ± SD) Information group**

PA Time period	Contemplators	Preparers	All
Pre-test	4.9 (2)	3.9 ± 1.8 (24)	3.9 ± 1.9 (26)
Four weeks	2.75 (1)	5.4 ± 3.2 (18)	5.2 ± 3.1 (19)
Six months	4.5 (1)	4.7 ± 4.1 (20)	4.6 ± 3.9 (21)

Table 4.9 **Physical activity (hr.wk^{-1}) at pre-test, four weeks, three months and six months post test (Mean ± SD) Fitness asessment group**

PA time period	Contemplators	Preparers	All
Pre-test	4.5 ± 3.2 (8)	4.4 ± 2.8 (34)	4.4 ± 3.0 (42)
Four weeks	4.6 ± 2.6 (7)	5.2 ± 2.7 (29)	5.1 ± 2.9 (36)
Six months	2.8 ± 1.0 (4)	3.5 ± 3.2 (27)	3.4 ± 3.4 (31)

Table 4.10 **Physical activity (hr.wk^{-1}) at pre-test, four weeks, three months and six months post test (Mean ± SD) Exercise Consultation group**

PA time period	Contemplators	Preparers	All
Pre-test	1.7 ± 1.2 (10)	5.2 ± 3.2 (35)	4.5 ± 3.2 (35)
Four weeks	3.4 ± 3.0 (6)	5.8 ± 4.2 (33)	5.4 ± 4.1 (39)
Six months	3.1 ± 2.9 (8)	3.7 ± 3.1 (30)	3.5 ± 3.0 (38)

Table 4.11 **Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Information group**

Time period	Contemplators	Preparers	All
Pre - test	28.0 ± 8.5 (2)	24.5 ± 9.2 (24)	24.8 ± 9.0 (26)
Six months	31 (1)	27.7 ± 8.2 (20)	27.4 ± 8.1 (21)

Table 4.12 Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Fitness assessment group

Time period	Contemplators	Preparers	All
Pre-test	27.4 ± 10.0 (8)	28.7 ± 7.7 (34)	28.5 ± 8.1 (42)
Six months	35.0 ± 6.4 (4)	27.5 ± 7.5 (27)	28.4 ± 8.0 (31)

Table 4.13 Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	22.0 ± 7.3 (10)	25.6 ± 8.0 (35)	24.9 ± 7.9 (45)
Six months	25.8 ± 8.4 (8)	25.7 ± 8.5 (30)	25.7 ± 8.4 (41)

Table 4.14 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) Information group.

Time period	Contemplators	Preparers	All
Pre-test	11.0 (2)	12.5 ± 6.0 (24)	12.4 ± 6.0 (26)
Six months	9.0 (1)	10.8 ± 6.4 (20)	10.8 ± 6.2 (22)

Table 4.15 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) Fitness assessment group.

Time period	Contemplators	Preparers	All
Pre-test	8.9 ± 6.8 (8)	12.8 ± 6.7 (34)	12.0 ± 6.8 (42)
Six months	9.8 ± 5.1 (4)	12.8 ± 6.4 (27)	12.4 ± 6.2 (31)

Table 4.16 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	14.7 ± 6.5 (10)	11.8 ± 6.1 (35)	12.5 ± 6.2 (45)
Six months	13.9 ± 7.9 (8)	11.8 ± 7.0 (30)	12.3 ± 7.2 (38)

Table 4.17 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Information group

Time period	Contemplators	Preparers	All
Pre-test	10.0 (2)	9.4 ± 3.2 (24)	9.4 ± 3.1 (26)
Six months	12.0 (1)	10.4 ± 4.8 (20)	10.4 ± 4.6 (22)

Table 4.18 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Fitness assessment group

Time period	Contemplators	Preparers	All
Pre-test	8.6 ± 3.9 (8)	10.9 ± .8 (34)	10.25 ± 3.2 (42)
Six months	11.2 ± 2.6 (4)	11.0 ± 4.1 (27)	11.1 ± 3.9 (31)

Table 4.19 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	8.7 ± 4.0 (10)	10.7 ± 4.8 (35)	10.3 ± 4.7 (45)
Six months	9.1 ± 3.0 (8)	10.3 ± 4.9 (30)	10.0 ± 4.6 (38)

A repeated measures analysis for change in physical activity was carried out on those subjects who returned at recall and returned the questionnaire at four weeks. Schutz and Gessaroli (170) have pointed out that a necessary pre-condition for the calculated F statistic to be valid for all within subject effects (i.e. (T) and (G) x (T)), the sample must exhibit sphericity or circularity (repeat measures are uncorrelated with each other and have equal variances). The degree to which the data met these assumptions

is reflected in the parameter epsilon (e); a value of 1 denotes perfect sphericity and a low epsilon denotes serious violations.

Table 4.20 shows a repeated measures ANOVA summary table for physical activity with respect to subjects whose initial physical activity score was less than three and half hours (PA< 3.5 hrs.wk^{-1}) and table 4.21 shows a repeated measures ANOVA summary table with respect to physical activity for all subjects. There was a main effect for physical activity over time for subjects whose initial physical activity score was less than 3.5 hours per week; there was a group/time interaction (of borderline significance) when all subjects were in combined form.

Table 4.20 Repeated measures ANOVA on physical activity (hrs.wk^{-1}) for subjects with initial PA < 3.5 hrs.wk^{-1}

Source	SS	df	MS	F	p
Between subjects					
Intervention	4.14	2	2.07	0.336	0.716
Subjects within intervention	146.9	24	6.12	-	
Within Subject					
Time	60.76	2	30.38	10.422	0.00
Intervention x. Time	18.66	4	4.66	1.635	0.183
Error	137.78	48	2.87		

epsilon (e) = 0.915

Table 4.21 Repeated measures ANOVA on physical activity (hrs.wk^{-1}) for all subjects .

Source	SS	df	MS	F	p
Between subjects					
Intervention	2.19	2	1.10	0.06	0.94
Subjects within intervention	1299.42	74	17.56	-	
Within Subject					
Time	35.73	2	17.87	2.64	0.075
Intervention x Time	70.29	4	17.57	2.60	0.039
Error	1001.15	148	6.76	-	
Total					

epsilon (e) = 0.996

Differences in leisure time physical activity within (dependent t test) and between group (anova) at four weeks are shown in Table 4.22, 4.23 and 4.24,4.25 respectively. All groups show an significant increase with the fitness assessment group significant at 0.01 level.

Table 4.22 Difference in physical activity (hrs.wk^{-1}) within groups at 4 weeks Subjects (PA< 3.5 hrs.wk^{-1})

	N	MEAN	STDEV	T	P VALUE
Information	9	1.622	1.837	2.65	0.015
Fitness assessment	14	1.907	2.237	3.19	0.0036
Exercise consultation	15	1.850	2.767	2.59	0.011

Table 4.23 Difference in physical activity (hrs.wk^{-1}) within groups at 4 weeks All subjects

	N	MEAN	STDEV	T	P VALUE
Information	20	1.134	3.005	1.69	0.054 ns
Fitness assessment	39	0.572	3.477	1.03	0.16 ns
Exercise consultation	42	0.793	4.060	1.27	0.11 ns

significant at 0.05 level

Table 4.24 Difference in physical activity (hrs.wk^{-1}) between groups at 4 weeks Subjects (PA< 3.5 hrs.wk^{-1})

SOURCE	DF	SS	MS	F	p
FACTOR	2	0.54	0.27	0.04	0.958
ERROR	36	224.99	6.25		
TOTAL	38	225.53			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-------+---------+---------+---------
Info.	9	4.075	1.780	(----------*----------)
F.A.	14	3.850	2.159	(----------*----------)
E. C.	16	3.770	3.045	(----------*----------)
				-------+---------+---------+---------

POOLED STDEV = 2.500 3.0 4.0 5.0

Table 4.25 Difference in physical activity (hrs.wk^{-1}) between groups at 4 weeks All Subjects

SOURCE	DF	SS	MS	F	p
FACTOR	2	2.5	1.2	0.10	0.904
ERROR	98	1204.2	12.3		
TOTAL	100	1206.7			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	----+---------+---------+---------+--
Information	20	5.162	3.115	(----------*----------)
Fitness assessment	39	5.432	2.887	(---------*---------)
Exercise consultation	42	5.590	4.142	(---------*---------)
				----+---------+---------+---------+--

POOLED STDEV = 3.505 4.0 5.0 6.0 7.0

Psychological Well-Being

Tables 4.26 to 4.31 show within group differences (t test) for each of the three domains whereas Table 4.32 to Table 4.37 show between group differences (anova). All differences are taken at the six month post test interval. There was a significant difference in group means for coping deficits (Table 4.34).

Table 4.26 Differences in coping assets at post test- Subjects (PA< 3.5 hrs.wk^{-1})

	N	MEAN	STDEV	t	P VALUE
Information	9	3.67	8.49	1.30	0.12
Fit.assessment.	12	-0.58	6.40	-0.32	0.62
Ex.Consultation.	14	0.79	7.32	0.40	0.35

Table 4.27 Differences in coping assets at post test - all subjects

	N	MEAN	STDEV	t	P VALUE
Information	22	2.59	7.76	1.57	0.066
Fit.assessment.	34	1.03	6.57	0.91	0.18
Ex.Consultation.	41	0.61	7.23	0.54	0.30

Table 4.28 Differences in coping deficits at post test - Subjects (PA< 3.5 hrs.wk^{-1})

	N	MEAN	STDEV	t	P VALUE
Info	9	3.33	6.78	1.47	0.91
F.A.	12	3.00	8.49	1.22	0.88
E.C.	14	0.71	7.30	0.37	0.64

Table 4.29 Differences in coping deficits at post test - All subjects

	N	MEAN	STDEV	t	P VALUE
Info	22	-2.18	7.52	-1.36	0.094
F.A..	34	-0.94	7.90	-0.69	0.25
E.C.	41	0.34	6.97	0.31	0.62

Table 4.30 Differences in physical well-being at post test - Subjects (PA< 3.5 hrs.wk^{-1})

	N	MEAN	STDEV	t	P VALUE
Info	9	1.22	5.12	0.72	0.25
F.A.	12	0.25	3.11	0.28	0.39
E.C.	14	-1.07	4.32	-0.93	0.81

Table 4.31 Differencs in physical well-being at post test - All subjects

	N	MEAN	STDEV	T	P VALUE
Infor.	22	0.73	3.92	0.87	0.20
F.A.	34	-0.15	4.08	-0.21	0.58
E.C.	41	-0.66	3.83	-1.10	0.86

Table 4.32 Coping assets at post test by ANOVA - Subjects (PA< 3.5 hrs.wk^{-1})

SOURCE	DF	SS	MS	F	p
FACTOR	2	21.8	10.9	0.18	0.833
ERROR	32	1896.1	59.3		
TOTAL	34	1917.9			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-+---------+---------+---------+-----
Information	9	26.000	7.228	(----------*----------)
Fit. assessment	12	27.417	7.513	(----------*----------)
Ex. consultation	14	25.643	8.120	(----------*----------)
				-+---------+---------+---------+-----
POOLED STDEV = 7.698				21.0 24.5 28.0 31.5

Table 4.33 Coping assets at post test by ANOVA- All subjects

SOURCE	DF	SS	MS	F	p
FACTOR	2	123.2	61.6	0.95	0.391
ERROR	94	6113.7	65.0		
TOTAL	96	6236.9			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	--------+---------+---------+--------
Information	22	27.364	8.145	(----------*----------)
Fit. assessment	34	28.235	7.977	(----------*----------)
Ex. consultation	41	25.707	8.094	(---------*---------)
				--------+---------+---------+--------
POOLED STDEV =	8.065			25.0 27.5 30.0

Table 4.34 Coping deficits at post test by ANOVA- Subjects (PA< 3.5 hrs.wk^{-1})

SOURCE	DF	SS	MS	F	p
FACTOR	2	313.9	156.9	4.46	0.019
ERROR	32	1124.9	35.2		
TOTAL	34	1438.7			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	---+---------+---------+---------+---
Information	9	7.000	3.606	(---------*---------)
Fit. assessment	12	14.000	6.382	(--------*--------)
Ex. consultation	14	13.714	6.638	(-------*-------)
				---+---------+---------+---------+---
POOLED STDEV =	5.929			4.0 8.0 12.0 16.0

Table 4.35 Coping deficits post test by ANOVA- All subjects

SOURCE	DF	SS	MS	F	p
FACTOR	2	35.0	17.5	0.41	0.666
ERROR	94	4018.8	42.8		
TOTAL	96	4053.8			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	---------+---------+---------+------
Information	22	10.818	6.169	(----------*----------)
Fit. assessment	34	12.000	6.110	(---------*---------)
Ex. consultation	41	12.366	7.049	(---------*---------)
				---------+---------+---------+------
POOLED STDEV =	6.539			10.0 12.0 14.0

Table 4.36 Physical well-being at post test by ANOVA - Subjects (PA< 3.5 hrs.wk^{-1})

SOURCE	DF	SS	MS	F	p
FACTOR	2	29.6	14.8	0.83	0.447
ERROR	32	573.1	17.9		
TOTAL	34	602.7			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-------+---------+---------+---------
Information	9	10.444	5.341	(----------*----------)
Fit assessment	12	11.083	3.059	(----------*----------)
Ex. consultation	14	9.000	4.315	(----------*----------)
				-------+---------+---------+---------
POOLED STDEV =		4.232		8.0 10.0 12.0

Table 4.37 Physical well-being at post test by ANOVA- All subjects

SOURCE	DF	SS	MS	F	p
FACTOR	2	7.4	3.7	0.20	0.821
ERROR	94	1752.1	18.6		
TOTAL	96	1759.4			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	----+---------+---------+---------+-
Information	22	10.409	4.636	(----------*----------)
Fit. assessment	34	10.647	3.999	(----------*----------)
Ex. consultation	41	10.024	4.396	(----------*----------)
				-----+---------+---------+---------+-
POOLED STDEV =		4.317		9.0 10.0 11.0 12.0

Discussion

Physical activity

With respect to subjects whose initial physical activity score was < 3.5 hrs.wk^{-1}, the repeated measures analysis revealed that there was a main positive effect over time. This is an unexpected result. One might have expected the information group to show some effect but not as great as the other two interventions. Secondly, one would have expected any change in the information group to drop off rapidly (i.e. beyond the 4 week measure), thereby showing the effectiveness of the other two, more intensive

interventions. Thirdly, one would have expected the information group to exhibit little, if any, time effect at six months. The follow-up test for the borderline group/time interaction (all subjects- not excluding subjects whose initial score was ≥ 3.5 hrs.wk^{-1})) revealed no significant difference in paired group means.

This change in physical activity by the information group- similar to the fitness assessment and exercise consulation groups, must be interpreted with due caution. As previously documented, eleven subjects in the information group declined to take part. A further nine subjects were randomly re-allocated to either the fitness assessment or exercise consultation. This re-allocation partially compromised the random allocation of subjects and the internal validity of the study. The re-allocation of these subjects however would probably have strengthened the differences between the fitness assessment/exercise consultation groups and the limited intervention of information only. To ensure internal validity in this context in study three, random assignment was strictly adhered to.

Psychological well-being

The analysis of change in psychological well-being scores revealed that there was only one significant difference from pre- to six months post test in group means in the coping deficits dimension. There is no logical reason why, given there was an increase of physical activity over time, only one of the three dimensions significantly changed. There is a strong likelihood that the results in this context have been influenced by the fact that the information group had small numbers of subjects

The main researcher saw all subjects in the information group. As he was known to many of them, there was likely to have been an interviewer effect which may partially explain why this group showed a change over time. In study three the main researcher did not take part in any intervention. Two different pairs of research assistants were used at pre- and post test in study two. Additionally, in this study researchers shared responsibility at pre-test for the fitness assessment and exercise consultation subjects; at post test each research assistant was responsible for either fitness assessment or exercise consultation. In study three, the same research assistants were used at pre- and post test; each research assistant was responsible for the same group of subjects thoughout the study. In this way interviewer effect was minimised and any bias was consistent across three groups.

Subjects whose physical activity initial score was greater than three and a half hours were analysed separately. The figure of three and a half hours per week is a

reasonable cut-off point in line with the current recommendations from the American College of Sports Medicine and the Centres for Disease Control and Prevention on health related physical activity (31). This measure however drastically reduced numbers of subjects (below fifteen in all groups; six in the information only group) and thus reduced the power of the study. It also calls into question whether the research assistants diligently asked subjects whose 7d recall was greater than three and a half hours, constitued a *normal* amount of physical activity in one week.

With respect to the design of the questionnaire, few staff (6%) in the present study found difficulty in placing themselves in a category. A previous U.K. study (168) had 13% of their sample in this category; this study asked respondents to score at each stage of change category using a Likert scale. The adapted questionnaire however asked respondents to tick one box appropriate to one category of stage. An optional section at the end of the questionnaire allowed staff to explain why they could not place themselves in any one single category description. In study three, a number of modifications were made: the 'optional section' was removed as very few subjects needed to use it; each subject was asked for a telephone extension and shift pattern for ease of contact; the criteria for regular physical activity in the sub-section 'general physical activity' was raised from fifteen mintutes to thirty minutes per day in line with recoomendations set out by the American College of Sports Medicine.

A response rate of 42 per cent was achieved in the postal survey. Two earlier surveys of NHS staff have yielded higher response rates. In the first example, a survey of eight hundred and seventy staff carried out by Leeds Health Care yielded a response rate of 78% (171) and a second larger survey undertaken by North Western Regional Health Authority with five thousand seven hundred and eighteen staff, gained a response rate of 62% (172). A recent local survey however, carried out by South Ayr Hospitals NHS Trust with its employees only received a response rate of 24 per cent (173). N.H.S. provision within the U.K. has undergone extensive and rapid change leading to, amongst other feelings, a degree of uncertainty with respect to job security. In this climate of unprecented change within the N.H.S., a return rate of 42% to a study on leisure time physical activity is acceptable.

The author canvassed the views of staff on the research project; these staff were chosen on an opportunistic basis around the hospital. There was a general feeling that specific parts of the research i.e. fitness assessment may have had hidden agendas. There was a degree of suspicion that the project was linked in some way to a 'management or personnel tool'. There was a query as to why the project was interested in *leisure time* physical activity.

There was one change to fitness assessment procedure in study three. The measures of local muscular endurance, 'sit-ups' and 'press-ups', were discontinued due to the fact that the majority of subjects found them too demanding to complete and scored very low ratings. A simple hand-grip measure was used to measure this component.

There were two additional changes to the procedures in study three. Firstly as the return rate of the 7d re-call was low at the twelve week period, a financial incentive (in the form of a prize draw) was used to increase return rate; notification of the financial incentive was publicised via the newsletter. Secondly, all subjects were asked to complete an expectancy questionnaire prior to the intervention; the questionnaire consisted of two brief questions on 'change of intention' and 'change in behaviour'. In this way subjects' perception of the intervention could be judged before taking part.

Summary

Study two with NHS employees put into operation the relevant findings from study one. The sampling frame in study two was a workplace setting, thereby allowing for a much larger potential source of recruits. A questionnaire was devised which was used to identify sedentary employees and recruit them as potential subjects. The 7d recall physical activity questionnaire was further developed allowing for a more accurate reflection of change in this independent variable. The return rate of the 7d recall questionnaire at the three month period was very low and the use of a financial incentive (prize draw) was to be offered in study three. As research assistants were employed to carry out the interventions, training days prior to pre- and post test were devised by the main researcher to ensure that the research protocols were adhered to. The results which showed a time but no group effect was surprising. It may be partially explained by low numbers in the study, an interviewer effect with the information only group and the fact that the original random assignment was partially compromised. Study three which was carried out in an NHS workplace setting, used a larger group of subjects with more rigorous procedures. Chapter five which follows decribes the methodology of study three and results are set out in chapter six.

Chapter 5

Study Three

Crosshouse Hospital, Kilmarnock
May 1994 -October 1994

Introduction

Study three was carried out with sedentary NHS employees based at Crosshouse Hospital in Kilmarnock, a large hospital with full accident and emergency facilities. The specific objectives of the study three were as follows:

(1) to recruit a large sample of sedentary staff

(2) to compare the effectiveness of three exercise interventions.

The methodology of study three is described and the results are then analysed. Where appropriate, comparisons are made with study two which was carried out with similar subjects and in a similar workplace setting.

Subjects

One hundred and seventy nine sedentary subjects (Mean= 37.9, SD= 10.0 years) who were employees of North Ayrshire and Arran NHS Trust took part in study three. One hundred and thirty two subjects (74%) were female and 47 subjects (26%) were male. Of the one hundred and seventy nine subjects, fifty one (28.5%) were classified as 'contemplators' and one hundred and twenty eight (71.5%) were classified as 'preparers' in a stage of change questionnaire.

Instruments

'Stage of Change' questionnaire

A modified version of the stage of change questionnaire was produced to identify sedentary NHS staff as potential subjects for study three [Appendix 17]. This questionnaire was slightly amended by altering a small number of features. The open category section was removed and in the criteria section relating to "regular physical activity", the duration of physical activity was increased from 15 minutes to 30 minutes. In the occupational category section the category 'other' was added. Minor textual changes were performed and the questionnaire was run off by professional printers to enhance the overall look of the questionnaire.

Fitness Assessment

The fitness assessment protocol for study three was identical to study two with the exception of grip strength being added to provide a 'global' measure of strength. A Takei 'Grip-A' hand dynamometer was used.

Exercise Consultation

The pro-forma was identical to study two.

Dependent measures

i) An amended version of the seven day recall of leisure time physical activity questionnaire was used [Appendix 18]. The main change involved the addition of a visual grid to assist subjects to reach a decision on which activities to include in the form.

ii) Psychological well-being

The psychological well being questionnaire was identical to the one used in study two.

Expectation questionnaire

A two item questionnaire was devised to gain feedback on subjects' perception of the effectiveness of their respective group exercise intervention [Appendix 19].

Procedures

A 'Stages of Change' questionnaire was distributed via the internal mailing system to two thousand, one hundred and seventeen staff of North Ayrshire and Arran NHS Trust based at Crosshouse Hospital, Kilmarnock. Seventeen questionnaires were returned to the main researcher unopened, with the addressee unable to be located. One thousand and thirty one questionnaires were returned giving a response rate of 49%. The Personnel Department of the Trust supplied the main researcher with individually addressed labels thus easing the administrative workload. Staff returned the questionnaire using the same mailing system. Secretarial assistants working on the exercise project then attempted to contact staff who were in the contemplation and preparation stages of change. At least two attempts were made to contact such staff. The pre- and post test parts of the study took place in May 1994 and October 1994 respectively. The interventions were carried out during normal working hours i.e. nine a.m. until five p.m. It took three weeks to complete both pre- and post test phases of study three. Subjects were randomly assigned to one of the three intervention groups. Seventy five subjects were assigned to fitness assessment, sixty one to exercise consultation and forty three to information only.

Allocation of work to research assistants

Three research assistants were employed to carry out all the exercise interventions at pre- and post test. Each assistant saw the same subject at pre- and post test. Two training days (prior to pre- and post test) were organised for these assistants to familiarise them with the research protocols.

All subjects were initially asked to complete an expectation effect questionnaire. For scoring purposes, the two negative dimensions to each question were assigned -2 and

-1, the undecided category was scored as zero and the two positive dimensions were assigned scores 1 and 2 respectively. Subjects were then asked to complete a psychological well-being questionnaire. The research assistants assisted subjects by explaining how to complete the questionnaire. The Physical Activity Readiness Questionnaire (PARQ) was completed by both the fitness assessment and the exercise consultation groups. The 7d recall physical activity questionnaire was then completed within an interview structure.

Fitness assessment - grip strength
The dynamometer grip width was adjusted to accommodate individual hand grip width. From a standing position, the subject held the grip dynamometer in the dominant hand with the arm held straight alongside the body. Each subject was allowed three attempts with the highest score being recorded.

All subjects received a free T-Shirt if they completed and returned the 7d recall questionnaire at a four week interval. A newsletter was distributed via internal mail to all subjects prior to the three month interval[Appendix 20]. The newsletter contained information of a prize draw which subjects could enter if they completed and returned the 7d recall physical activity questionnaire at the three month interval.

All subjects were contacted two weeks prior to the six months post test. After post test letters were sent out via the internal mail system to all subjects who did not attend the follow up intervention. This correspondence requested these subjects to complete and return the psychological well-being questionnaire and the 7d recall physical activity questionnaire.

All other procedures in study three were identical to study two.

Results
The distribution of respondents to the five categories of stage of change can be seen in Table 5.1. The 'spoiled'/invalid category included questionnaires returned as sent, subjects ticking more than one box relating to stage of change and subjects who did not tick any box relating to stage of change.

Table 5.1 Distribution of respondents [N=1031] to stage of change

Stage	category	count	%
0	'spoiled'/invalid	14	1
1	pre-contemplation	35	3
2	contemplation	150	15
3	preparers	385	37
4	action	66	7
5	maintainers	381	37

A comparison of the findings in study three to study two in relation to respondents' stage of change classification is seen in Figures 5.1 and 5.2 respectively. There was a similar distribution of subjects to the five stages in both studies.

Figure 5.1 Classification of respondents by stage of change (Study 3)

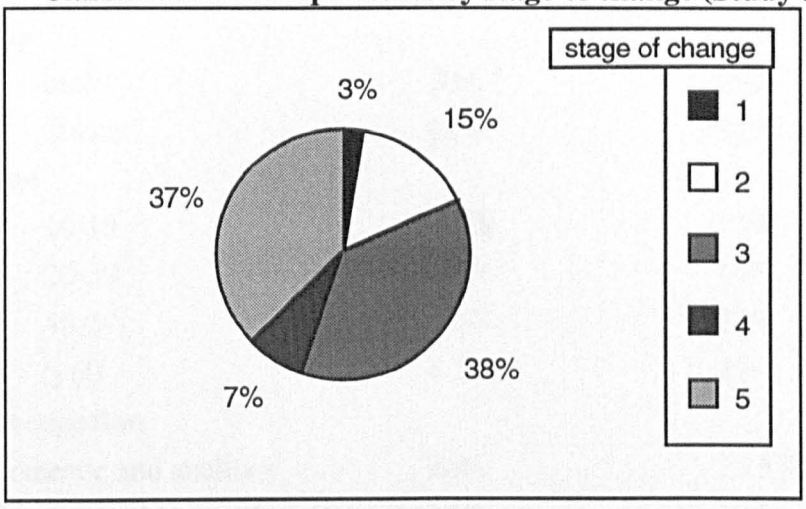
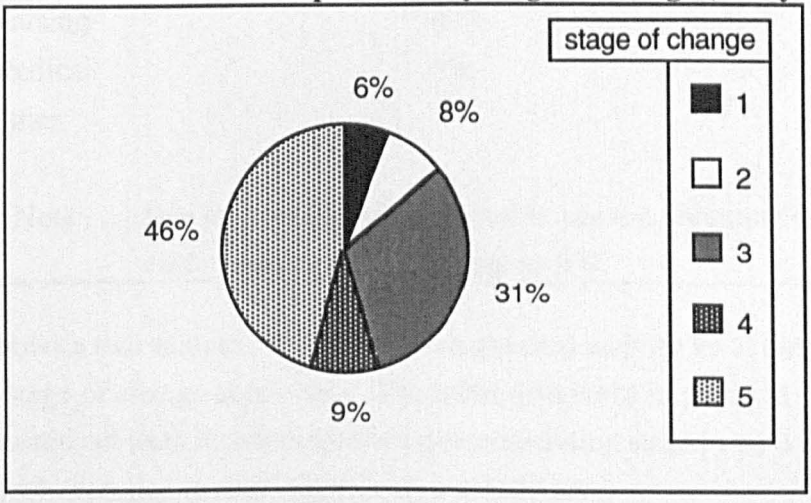


Figure 5.2 Classification of respondents by stage of change (Study 2)



[Note each number refers to the following stage of change:
1= Pre-contemplation; 2= Contemplation; 3= Preparation; 4= Action;
5= Maintenance]

Comparisons of subjects with the sampling frame (i.e. total number of employees at the hospital site who returned the stage of change questionnaire) in relation to age, sex and occupational status are given in Table 5.2. It can be seen that in terms of age and gender, respondents were similar to the total sampling frame. In relation to occupational category, study three attracted a representative sample from the occupational settings though there was a slight under representation of employees from the 'Domestic and Ancillary' category. However, the additional category 'other' was given by seven per cent of respondents in study three.

Table 5.2 Comparison of returns to sampling frame for sex, age and occupational categories

	Sampling frame (n=2117)	**Respondents (n=1031)**
Sex		
male	20%†	19%†
female	80%	81%
Age		
16-19	0.9%	<1%
20-39	50%	60%
40-59	48%	37%
≥ 60	1.1%	2%
Occupation		
Domestic and ancillary	26%	15.5%
Administrative and clerical	15%	18%
Para-medical	11%	10%
Nursing	43%	52%
Medical	5%	7%
Other	-	7%

[†Note: Due to rounding off, the total in percent columns for each category may not come to 100.

Table 5.3 shows a two sample t test to compare physical activity level means of subjects by stage of change at pre- test. The mean difference in physical activity at pre- test between subjects in contemplation and preparation stages was 0.94 hour (~ 56 minutes) which failed to reach significance at 0.05 level.

Table 5.3 Two sample t test of physical activity (hr.wk^{-1}) at pre- test in relation to stage of change

Stage of Change	N	Mean	STDEV	t	p
Contemplator	47	2.93	3.8	-1.52	0.13
Preparer	122	3.87	3.01		
95 PCT CI (-2.17, 0.29; hr.wk^{-1})					

The return rate for physical activity questionnaires at the three month interval was 49% for the information group, 43% for the exercise consultation group and 49% for the fitness assessment group; corresponding rates in study two were 40%, 35% and 40% respectively.

The percentage return rate of subjects at post test is given in column three of table 5.4; those subjects who did not attend for recall but returned the postal questionnaires are given in column four. The attendance and return rate for subjects in study two is given in brackets. There were similar rates in both studies although the number of subjects who returned the postal questionnaires at post test in the information group dropped from 19% to 5%.

Table 5.4 Attendance and postal return rate by subjects at post-test

Intervention	Pre-test (N)	Post-test	Returned questionnaires
Information only	43	67% (65%)	5% (19%)
Fitness assessment	75	47% (53%)	27% (24%)
Exercise consultation	61	75% (64%)	20 % (21%)

Note - figures in brackets refer to corresponding data from subjects in study two

Subjects' responses to the two item expectation effect questionnaire completed at pre-test are shown in table 5.5. The mean scores for each group shows that subjects in the information group have relatively less expectation of their intervention on both items in the questionnaire.

Table 5.5 Response to expectation effect.

	Score dimension					
	-2	-1	0	1	2	Mean
INTENTION						
Information	5	9	3	18	7	0.3
Exercise consultation	1	1	4	20	33	1.4
Fitness assessment	0	0	1	35	38	1.5
ACTUAL CHANGE						
Information	4	11	5	19	3	0.1
Exercise consultation	0	2	4	35	18	1.2
Fitness assessment	0	1	4	46	20	1.2

Physical activity

Tables 5.6 to 5.8 show group means and standard deviation in physical activity at pre-test, four weeks, three months and six months post test for each group intervention.

Table 5.6 Physical activity ($hr.wk^{-1}$) at pre-test, four weeks, three months and six months post test (Mean ± SD) Information group

PA Time period	Contemplators	Preparers	All
Pre-test	2.8 ± 3.2	4.2 ± 2.6	3.9 ± 2.8
Four weeks	7.3 ± 5.1	6.8 ± 5.2	7.0 ± 5.1
Three months	10.6 ± 16.6	6.4 ± 7.7	3.6 ± 3.2
Six months	7.9 ± 8.7	4.2 ± 3.0	5.4 ± 5.7

Table 5.7 Physical activity ($hr.wk^{-1}$) at pre-test, four weeks, three months and six months post test (Mean ± SD) Fitness assessment group

PA time period	Contemplators	Preparers	All
Pre-test	2.2 ± 2.5	4.1 ± 3.3	3.6 ± 3.2
Four weeks	5.8 ± 3.6	5.9 ± 4.0	5.9 ± 3.4
Three months	8.6 ± 5.5	7.0 ± 5.7	7.4 ± 5.6
Six months	5.6 ± 4.5	3.4 ± 2.5	4.0 ± 3.2

Table 5.8 **Physical activity (hr.wk^{-1}) at pre-test, four weeks, three months and six months post test (Mean ± SD) Exercise consultation group**

PA time period	Contemplators	Preparers	All
Pre-test	3.8 ± 5.2	3.3 ± 2.8	3.4 ± 3.6
Four weeks	7.3 ± 5.5	7.2 ± 5.6	7.3 ± 5.5
Three months	7.6 ± 6.7	6.8 ± 3.4	7.0 ± 4.3
Six months	6.8 ± 8.4	4.3 ± 3.7	5.3 ± 6.0

Psychological Well-being

The mean and standard deviation at pre- test and six month post test in each group for coping assets is given in tables 5.9 - 5.11, coping deficits in tables 5.12 to 5.14 and physical well-being in tables 5.15 - 5.17.

Table 5.9 **Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Information group**

Time period	Contemplators	Preparers	All
Pre - test	21.2 ± 7.4	25.2 ± 5.9	24.1 ± 6.5
Six months	29.0 ± 3.1	27.2 ± 6.7	27.7 ± 5.9

Table 5.10 **Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Fitness assessment group**

Time period	Contemplators	Preparers	All
Pre-test	25.4 ± 6.5	27.1 ± 8.5	26.7 ± 8.1
Six months	25.7 ± 6.4	26.9 ± 9.2	26.5 ± 8.3

Table 5.11 Psychological well-being - coping assets at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	23.2 ± 10.6	27.3 ± 7.6	26.0 ± 8.7
Six months	28.8 ± 8.7	29.0 ± 8.0	29.0 ± 8.2

Table 5.12 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) Information group.

Time period	Contemplators	Preparers	All
Pre-test	16.3 ± 6.7	11.7 ± 6.3	13.0 ± 6.6
Six months	11.3 ± 6.5	9.4 ± 4.2	10.0 ± 5.0

Table 5.13 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) *Fitness* assessment group.

Time period	Contemplators	Preparers	All
Pre-test	10.4 ± 4.7	11.2 ± 5.1	11.0 ± 5.0
Six months	10.5 ± 5.0	9.4 ± 5.3	9.8 ± 5.2

Table 5.14 Psychological well-being - coping deficits at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	13.5 ± 6.0	11.0 ± 5.4	11.8 ± 5.6
Six months	10.1 ± 3.2	9.6 ± 6.0	9.8 ± 5.1

Table 5. 15 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Information group

Time period	Contemplators	Preparers	All
Pre-test	8.5 ± 4.4	11.4 ± 2.6	10.6 ± 3.4
Six months	13.0 ± 4.1	10.9 ± 2.9	11.5 ± 3.4

Table 5. 16 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Fitness assessment group

Time period	Contemplators	*Preparers*	All
Pre-test	9.4 ± 3.6	10.5 ± 3.5	10.2 ± 3.5
Six months	9.4 ± 4.2	11.2 ± 3.5	10.6 ± 3.8

Table 5. 17 Psychological well-being - physical well-being at pre- and six months post test (Mean + SD) Exercise consultation group

Time period	Contemplators	Preparers	All
Pre-test	7.0 ± 4.0	10.5 ± 3.5	10.2 ± 3.5
Six months	8.1 ± 3.3	11.4 ± 4.5	10.2 ± 4.3

Table 5.18 depicts a 2 (stage of change) by 3 (intervention group) by 4 (time) repeated measures ANOVA summary table with repeat measures on the last factor. The analysis showed a significant main effect for time and an interaction effect for stage of change by time.

Table 5.18 **A 2 (stage of change) by 3 (intervention group) by 4 (time) repeated measures ANOVA summary table with repeat measures on the last factor (physical activity -hr.wk^{-1}).**

TEST†	DF	CHI-SQUARE‡	P-VALUE
soc	1	2.14	0.144
grp	2	1.73	0.422
t	3	78.33	0.000
soc x grp	2	0.43	0.805
soc x t	3	17.78	0.000
grp x t	6	4.20	0.650
soc x grp x t	6	3.39	0.759

Note † soc = stage of change; grp = intervention group; t = time
‡ Repeated measures based on Wald test

The main effect for time in all groups is graphically presented in figure 5.3 which plots the physical activity means over the four time periods for all subjects. Follow -up tests to investigate the effects are shown in table 5.19. The analysis of the 95 percent confidence intervals revealed that the means at time periods 2 (four weeks), 3 (three months) and 4 (six months post test) were greater than time period 1 (pre-test). The negative difference in means from time period 3 (three months) to 4 (six months post test) was of borderline significance.

Figure 5.3 Physical activity (hr.wk^{-1}) means over time- all subjects

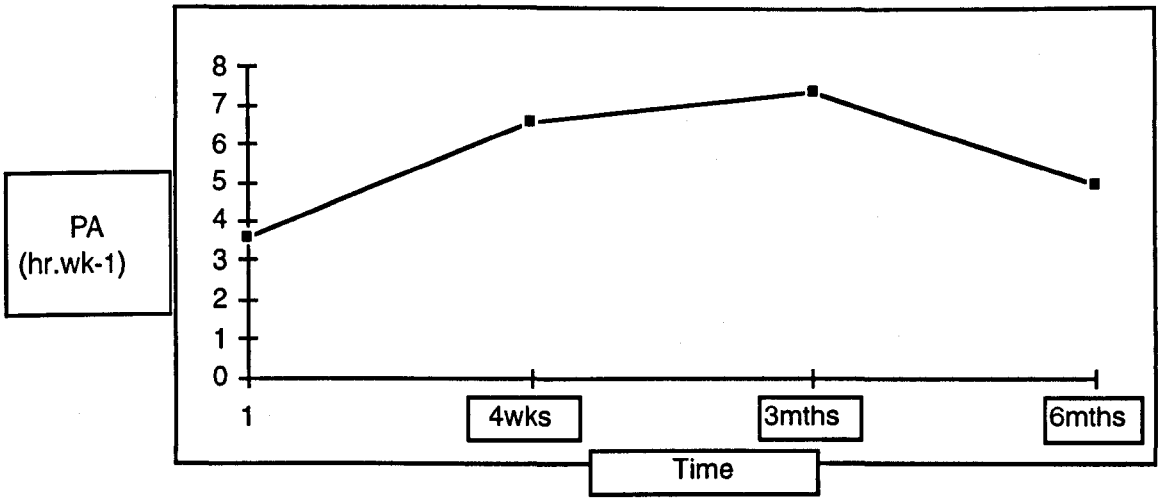


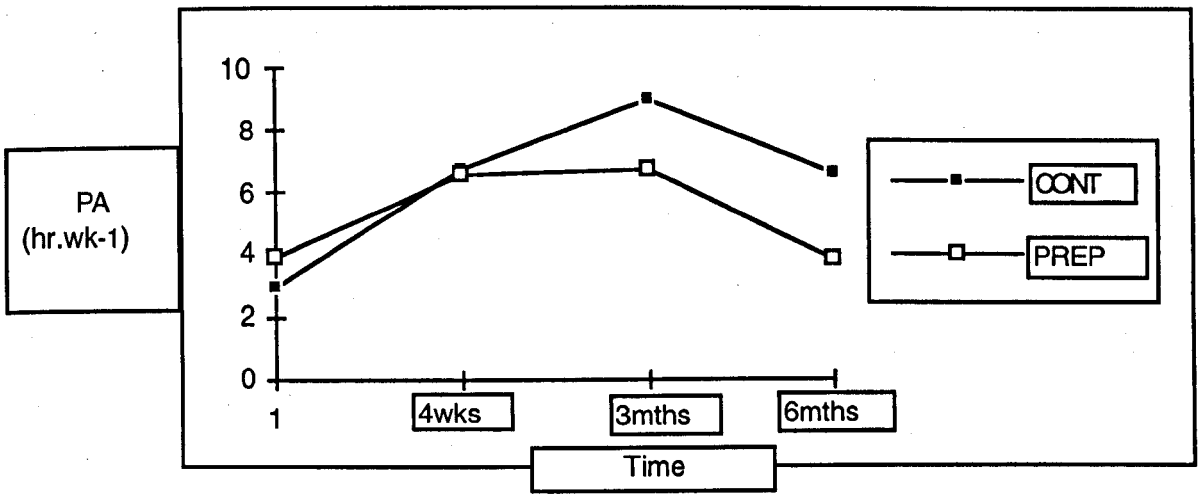
Table 5.19 95 PERCENT CI's for differences in group PA means over four time periods.

PA Time Period	95 PERCENT CI
2 - 1	(1.87, 3.78)
3 - 2	(-1.58, 1.98)
4 - 3	(-3.85, 0.06)
4 - 1	(0.07, 2.59)
4 - 2	(-2.96, 0.20)
3 - 1	(1.85, 5.32)

Note: 1= pre- test; 2 = 4 weeks; 3 = 3 months; 4 = 6 month post test

The plots of physical activity means by stage of change are shown in figure 5.4. The means for each group do cross over between the four time periods thereby producing the stage of change x time interaction.

Figure 5.4 Physical activity (hr.wk^{-1}) means over time by stage of change.



Note: CONT = Contemplator; PREP = Preparer

Follow-up tests using a Bonferroni multiple comparison correction are shown in table 5.20. This table shows that there is a borderline significant difference between contemplator mean and preparer mean at time period 4 (six months post test). Contemplators seem to maintain positive change over a six month period better than preparers.

Table 5.20 95 percent CI's for each pair of stage of change means at four PA time periods.

PA time period	95 percent CI
1	(-2.52, 0.65)
2	(-2.12, 2.39)
3	(-3.90, 8.33)
4	(-5.92, 0.40)

Note: 1= pre- test; 2 = 4 weeks; 3 = 3 months; 4 = 6 month post test

Bearing in mind the framework suggested by Sallis and Hovell (61), whereby adoption and maintenance of physical activity should be viewed as separate phases, it was decided to carry out a number of planned comparsions to test for differences in PA within the time period from pre- to post test. A planned comparison of between group physical activity differences at 4 weeks, three months and six months was carried out for contemplator and preparer subjects. There were no significant differences between groups for subjects in the contemplation stage. In preparer

subjects there was a borderline difference (p=0.074) in group means at four weeks as shown in table 5.21.

Table 5.21 Group differences in PA (hr.wk^{-1}) in preparer subjects at four weeks by ANOVA

SOURCE	DF	SS	MS	F	p
Group	2	100.9	50.5	2.68	0.074
Error	97	1825.3	18.8		
Total	99	1926.3			

Individual 95 PCT CI's for mean based on pooled STDEV

LEVEL	N	MEAN	STDEV	----+----+----+----
Information	26	2.666	5.165	(----------*----------)
E.C.	32	3.856	4.419	(----------*----------)
F.A.	42	1.504	3.672	(----------*----------)
				----+----+----+----
				1.5 3.0 4.5

POOLED STDEV= 4.338

Follow up tests with a Bonferroni correction for multiple comparisons were carried out on paired group means. The 95 percent confidence intervals in table 5.22 show that there was a borderline significant difference between exercise consultation and fitness assessment group means.

Table 5. 22 95 CI's for differences in group means at four weeks in preparer subjects.

Information v Exercise consultation	(-1.08, 3.46)
Exercise consultation v Fitness assessment	(0.26, 5.01)
Information v Fitness assessment	(-0.52, 3.76)

Table 5.23 shows a significant difference in group means for physical activity levels from 3 months to post test.

Table 5.23 Group differences in physical activity (hr.wk^{-1}) in preparer subjects at 3 months - 6 months by ANOVA

SOURCE	DF	SS	MS	F	p
Group	2	258.9	129.5	4.54	0.016
Error	43	1224.8	28.5		
Total	45	1483.7			

Individual 95 PCT CI's for mean based on pooled STDEV

LEVEL	N	MEAN	STDEV	----+----------+----------+----------+ -------
Information	11	-1.005	3.385	(----------*----------)
E.C.	13	2.102	6.948	(----------*----------)
F.A.	22	-3.510	5.028	(----------*----------)
				----+----------+----------+----------+ -------
				-3.0 0.0 3.0

POOLED STDEV= 5.337

Follow up tests with a Bonferroni correction for multiple comparisons were carried out on paired group means. The 95 percent confidence intervals in table 5.24 show that there was a significant difference between exercise consultation and fitness assessment group means.

Table 5. 24 95 CI's for differences in PA group means at three months to six months in preparer subjects

Information v Exercise consultation	(-4.04, 10.25)
Exercise consultation v Fitness assessment	(0.52, 10.71)
Information v Fitness assessment	(-0.19, 7.93)

Psychological Well-being

In relation to the psychological well-being variable, differences in dimension means for all subjects are shown by dependent T tests in table 5.25. Only coping deficits showed a positive significant difference (lower score denotes positive change). Change in coping assets was of borderline significance.

Table 5.25 Differences by T test in psychological dimension means from pre- to six months post test: all subjects

	N	MEAN	STDEV	T	P
Coping assets	133	1.008	7.261	1.60	0.056
Coping deficits	133	-1.639	5.425	-3.48	0.0003
Physical well-being	133	0.368	3.991	1.06	0.14

Further analysis by one way ANOVA was carried out to see if changes in coping assets and coping deficits was dependent on stage of change or on group intervention. Table 5.26 and 5.27 show ANOVA summary tables for coping assets and deficits respectively. Neither stage of change nor group was a determininant for change in psychological well-being dimensions.

Table 5.26 ANOVA summary table: Coping assets - all subjects

Source	DF	SS	MS	F	p
SOC	1	87.43	118.01	2.17	0.144
Group	2	188.13	130.20	2.39	0.097
SOCxGroup	2	83.32	41.66	0.76	0.468
Error	112	6107.57	54.53		
Total	117	6466.44			

SOC - stage of change

Table 5.27 ANOVA summary table: Coping deficits - all subjects

Source	DF	SS	MS	F	p
SOC	1	25.52	26.64	0.91	0.341
Group	2	79.13	41.85	1.44	0.242
SOCxGroup	2	14.04	7.02	0.24	0.786
Error	112	3262.39	29.13		
Total	117	3381.08			

SOC - stage of change

Analysis of data from subjects in the fitness assessment group

The changes in fitness scores for subjects who completed a fitness assessment at post test were examined separately as this was the only group with these measures. Table 5.28 shows a t test for changes in aerobic power and physical activity. The analysis showed that there was a significant change in aerobic power. By separating subjects by gender, changes in aerobic power were further analysed. The significant difference in aerobic power was accounted for mainly by male subjects as can be seen in table 5.29. The corresponding change in physical activity in males of 0.825 hr (~50 minutes) as shown in table 5.30 failed to reach significance at 0.05 level (p=0.17).

Table 5.28 T test of differences in aerobic power (ml.kg.min^{-1}) and P.A. in male and female subjects at post test.

	N	MEAN	STDEV	T	P VALUE
Aerobic power	35	1.657	5.173	1.90	0.033
PA	54	0.229	3.006	0.56	0.29

Table 5.29 T test of differences in aerobic power (ml.kg.min^{-1}) from pre-test to post test for both male and female subjects.

	N	MEAN	STDEV	T	P VALUE
Male	11	3.36	5.59	2.00	0.037
Female	24	0.87	4.89	0.88	0.20

Table 5.30 T test of differences in PA (hr.wk^{-1}) at post test for male and female subjects

	N	MEAN	STDEV	T	P VALUE
Male	15	0.825	3.256	0.98	0.17
Female	40	-0.025	2.882	-0.05	0.52

A two sample t test examined male and female aerobic power scores at pre-test. Table 5. 31 showed a significant difference between male and female subjects. Table 5.32 showed there to be no corresponding difference however in physical activity between male and female subjects at pre- test.

Table 5.31 Two sample t test of aerobic power scores (ml.kg.min^{-1}) at pre-test for male and female subjects

	N	MEAN	STDEV	DF	T	p
Males	19	38.32	7.57	26	3.82	0.0007
Females	53	30.94	6.10			
95 PCT CI (3.4, 11.34)						

Table 5.32 Two sample t test of physical activity (hr.wk^{-1}) at pre-test for male and female subjects.

	N	MEAN	STDEV	DF	T	p
Males	19	3.57	2.75	37	0.07	0.95
Females	56	3.62	3.35			
95 PCT CI (-1.52, 1.62)						

Discussion

Comparisons to Study Two

There were a number of similarities in study three in relation to study two. Response rate to the stage of change questionnaire increased from 44% to 49%; the spread of staff to stage of change category was again similar; levels of drop-out at the six months recall were roughly the same.

Expectation effect

The tentative findings from the expectation effect questionnaire showed that subjects in the information group differed from subjects in the other two intervention groups, by having less positive perceptions in both intention to change and actual change. Thus the positive main effect for physical activity over time shown by all subjects is unlikely to be due to an expectation effect, since the information group experienced the same amount of physical activity change with less positive expectations.

Physical activity over time

The repeated measures ANOVA analysis showed there to be a positive main effect for PA over time and a stage of change x time interaction. A general trend of PA over time was apparent: a rapid increase in physical activity levels in the period pre-test to 4 weeks, followed by a levelling off effect in the region between four weeks to three months, and then any positive effect diminishing from three months to post test at six

months. The fact that subjects in the information group reacted positively to this intervention **and** sustained this change over a time period of six months is surprising. Any social interaction effect would likely to have waned beyond the 4 week interval and therefore a drop in physical activity level from 4 weeks through three months to post test at six months was expected. In spite of pre-conceived notions about ineffectiveness of information giving as an intervention, the analysis suggests that *targeting* individuals in a *positive* frame of mind (whether contemplators or preparers) and giving *appropriate* information in a *supportive* environment can have a positive effect. As there was no main effect for group this research has shown that there is no additional advantage in terms of physical activity or psychological change in carrying out fitness assessment or exercise consultation with sedentary subjects. The stage of change by time interaction suggested that contemplators needed less support over the maintenance period (from three to six months) than preparers. This finding is rather difficult to explain as the opposite finding was expected i.e. contemplators requiring more support than preparers. It is possible that preparers are more comfortable than contemplators with their current level of physical activity. This interaction though lends support to the case that the effects over time are not due to the confounds of local history, the 'Hawthorne Effect' or to test re-test familiarity; if they were, it would be expected that both contemplators and preparers would have reacted in the same way.

From the slopes of the graphs of PA over time, it is clear that no matter what form of intervention takes place, on-going support is essential. This support would help ensure that positive change beyond initial adoption of physical activity is maintained. Rather surprisingly, preparers seem to require more support than contemplators in the "maintenance" period i.e. from three months to six months.

Preparers

Planned comparisons were carried out to analyse the differences, if any, between subjects at times within the pre- to six months post test period. In this way, the adoption/maintenance issue could be further examined. These comparisons showed a number of differences between paired group means. There was a borderline significant positive difference between preparers in the exercise consultation and preparers in the fitness assessment in physical activity level at the four week interval; there was a significant positive difference between preparers in the exercise consultation and preparers in the fitness assessment in physical activity change from three months to six months post test. In the psychological well-being variable, there was a borderline significant positive difference between preparers in the exercise consultation and preparers in the fitness assessment in the physical well-being

dimension. There is some evidence therefore for exercise consultation being a marginally more effective intervention than fitness assessment beyond the initial four week adoption period. A degree of caution is expressed here as the repeated measure analysis of variance is a conservative test and positive findings from any planned ANOVA comparisons are more likely to suffer from Type 1 errors.

Psychological well-being

The analysis of change in psychological well-being from pre- to post test for all subjects found that there were a significant difference in only one (coping deficits) of the three psychological well-being dimensions - change in coping assets however was of borderline significance. Further analysis revealed that this change was not dependent on stage of change or group intervention. In a randomised study of the effects of aerobic training on healthy adults, King and colleagues (174) reported changes in perceptions of fitness and satisfaction with physical shape and weight but not in measures of depression, anxiety, well-being or stress. In a more recent study, Steptoe (21) assessed the impact of aerobic training on the psychological state of 'anxious healthy adults' and found significant differences in both negative and positive dimensions. The fact that subjects in this research changed in only the coping deficits psychological dimension is difficult to explain. There is little data in this area as the well-being measurement tool has only been recently constructed and other research has looked at the *training* effects of *aerobic* exercise.

Measurement of PA by 7d recall questionnaire

The analysis of physical activity scores by subjects' stage of change revealed there to be a borderline difference in activity levels between 'contemplators' and 'preparers', with 'preparers' having a higher score. This finding lends further support to the construction of the stage of change questionnaire. The analysis of subjects in the fitness assessment only group revealed that whilst there was a significant difference in aerobic power between subjects by stage of change, the corresponding difference in physical activity was not significant. It is possible that a Type II error has occurred (a false null hypothesis). In this case, it is likely that a significant difference has been masked by the large standard deviation which existed in measurement of physical activity by the 7d recall questionnaire. The statistical test is likely to suffer from low power to detect differences.

The separate analysis of subjects who completed a fitness assessment provided interesting data on the validity of the 7d recall questionnaire and on the gender specific responses to this type of intervention. This in part confirms the genetic influence on aerobic fitness dimension and on the inappropriateness of aerobic fitness

to validate the 7d recall questionnaire. A difference of fifty minutes in physical activity in male subjects failed to reach significance level, perhaps for the same reason as described above.

Fitness assessment

The analysis of subjects in the fitness assessment group revealed that only males increased their fitness (aerobic power) levels. Females did not significantly improve on the aerobic fitness scores in this intervention. The difference in gender response is not due to subjects, who were predominantly female, feeling uncomfortable with a male research assistant as the majority of subjects were seen by a female research assistant. The fitness assessment is biased towards aerobic fitness measurement and perhaps if the the assessment were directed more to "weight loss/ body tone", there might have been a significant effect in female subjects. It is possible that female subjects who are in the 'action' and 'maintenance' stage of change may respond more positively than those in the 'contemplator' and 'preparer' stages. This finding questions the wisdom of current practice in the health promotion field where fitness assessment is widely offered and seen as a way of motivating increases in physical activity.

Chapter 6

Conclusions and Recommendations

Physical activity behaviour

It has been suggested that the antecedents or determinants of physical activity require investigation at different points in the "natural history" of physical activity (61). Research must therefore tackle both adoption and maintenance of physical activity by the sedentary adult population as two separate but time related dimensions. It is likely that the greatest public health gain will be achieved by bringing about a change in the activity habits of the most sedentary group within the population. However, those who are the most sedentary may also be the most difficult to change. From a conceptual basis, it has become clearer that behaviour change appears dependent upon the individual's readiness to change. The transtheoretical or stage of change model is one theory, among many, which can help explain why change has occurred in an intervention and to help improve the effectiveness of an intervention.

The transtheoretical model

The transtheoretical model postulates that individuals can be classified as being in a particular stage of change and as a result of their stage are more or less likely to change behaviour. Additionally, process oriented interventions targeted at an individual's specific stage of change may accelerate initial adoption and further maintenance of physical activity.

An adapted 'stage of change' questionnaire was developed in this research to identify initially sedentary individuals and then help to recruit such individuals (specifically 'contemplators' and 'preparers') as subjects for the study. It is suggested that modification should be made to the wording in the *preparation* stage of the questionnaire [Appendix 17]. By incorporating an element of 'intend to do more' into the wording of the category, the format would be more in keeping with the *contemplation* stage. Further work is required to produce an "equivalence" when aggregating different amounts of exercise, sport and general physical activity so that the criteria 'regular physical activity' is a valid one. The questionnaire could have been used as a dependent variable in studies two and three i.e. by re-testing both 'contemplators' and 'preparers' to see whether they had progressed (or relapsed) along the stages of change. In the field of physical activity research there is a need for a simple yet valid mechanism or tool to identify individuals' activity status and their readiness to change. Given the initial positive findings from the questionnaire, it is recommended that the adapted form is applied in health related physical activity research.

Measurement of physical activity

The measurement of physical activity in free living situations has proven to be an extremely difficult task. Part of the problem in measurement lies in the fact that it is difficult to find what is "normal" for each individual- levels of physical activity vary considerably according to season, illness, family commitment, study commitment and so on. Another part of the problem lies in the difficulty of assessing the intensity of physical activity by self-report. Furthermore, it has been reported (154) (see also Appendix 5 and 6) that changes in PA do not correlate well with changes in VO_{2max} and that it is difficult to find alternative validation criteria.

This research used an adapted form of the 7d recall questionnaire to measure changes in leisure time physical activity. The questionnaire was tested for reliability in a separate small scale study. The questionnaire was reliable and work on validity confirmed the inappropriateness of certain objective criteria such as VO_{2max} and body mass index against which the recall questionnaire can be tested. Other researchers have concluded that the 7d recall questionnaire is a valid estimate of *current* physical activity. It was found that a relatively large standard deviation existed in the measurement of subjects' physical activity levels (and thus changes in the magnitude of almost one hour failed to reach significance level) with possible over estimation of actual physical activity participation. It is recommended that the 7d recall questionnaire is used initially within an interview framework to minimise potential overestimation of physical activity levels. In this way the questionnaire would more accurately reflect current levels. Additionally, where the level is extremely low or high (for a sedentary individual) the interviewer has the opportunity to confirm or correct the recall. It is recommended that the adapted 7d recall questionnaire be used in further studies of health related physical activity interventions whereby the initial findings on its applicability, validity and reliability can be confirmed.

Design Issues

The development of the PA dependent measure provides one example of the compromise struck in research between specific validity and reliability on the one hand and the more general subject acceptability on the other. Early work on self report questionnaires addressed validity by asking respondents to record all physical activity expenditure over a set time period (136). Such approaches place considerable onus on subjects and by their very nature alter the behaviour in question. This feature also highlights a distinction between a research study and a health promotion intervention programme. In a health promotion intervention which might have a succession of small interventions, it is difficult to conclude with any certainty which

part, or parts, of the intervention are responsible for an observed change. Additionally, from an external validity perspective, it then becomes problematic to replicate a study which has contained many component parts.

As Jamieson and Flood have pointed out the three main threats to experimental validity in exercise studies are attrition (internal), expectation (construct) and use of volunteers (external) (16). The figures relating to attrition (failure to attend at recall) at post test for studies two and three were 40% and 37% respectively. There was no significant differences in the attrition between groups. As there is little documented evidence of attrition in adults in free living conditions, it is difficult to comment on these figures. As attrition in adults in supervised exercise classes has been reported to be around 50% at a six month period, it would be reasonable to expect a similar attrition rate. Moreover, a very low attrition rate would likely reflect internal validity at the expense of external validity.

An experiment is susceptible to a confound produced by the differing demand characteristics of each group intervention. Another concern about expectation effect is whether the dependent measures (physical activity and psychological well-being) were particularly susceptible to such effects. As both measures were undertaken by self report there may well be an element of 'social desirability' in the responses. Analysis of the data on expectation effect from study three revealed that subjects in the information group had lower expectations of the effectiveness of the assigned intervention. The fact that subjects in this group exhibited a main effect over time in physical activity similar to the other intervention groups, is therefore all the more surprising and cannot be explained by expectation.

Subjects in all three studies were volunteers. A 'stages of change' questionnaire was developed to help recruit sedentary NHS employees to studies two and three. It would be reasonable to generalise these findings to settings where adults are sedentary and ready to change physical activity behaviour and employed in a positive work environment.

Individual interventions

The repeated measures analysis demonstrated that there was a main effect over time, no group main effect, no stage of change main effect but a stage of change by time interaction. This last finding lends further support to the fact that the positive change in physical activity by all groups is not due to the confounds of local history effect, a "Hawthorne Effect" or to test re-test familiarity.

Information only

This research has shown that information is a cost effective intervention. From an external validity perspective, a partial qualification should be made. All subjects in this study were recruited by a stage of change questionnaire and then subjects in the information only group were given appropriate leaflets containing advice and information on physical activity. These subjects worked within a workplace environment which was positive to and supportive of exercise promotion. Part of the research procedure involved subjects completing a 7d recall PA questionnaire in an interview setting, thus increasing the degree of social interaction. The act of freely giving information outwith these conditions or context and to individuals who have not been targeted, may not produce such positive effects.

Fitness assessment

This research has shown that the fitness assessment inteervention is not effective in increasing aerobic power or physical activity for adult sedentary women. It is not immediately clear why this is the case. Most subjects were seen by a female research assistant and therefore the finding is not due to a confound of the gender of the research assistant. As there were fewer males than females in the study, the significant change in males' VO_{2max} was probably indicative of a true change, since power in any test is increased by increasing the number of subjects.

The practice of fitness assessment ('testing') is fairly commonplace in the workplace setting, the NHS (used by physiotherapists and health education staff in health promotion) and is used widely in leisure centres (both local authority and privately run fitness clubs). It is suggested that fitness assessment may be more appropriate for women who are already active i.e. classified as 'actioners' and 'maintainers'. Fitness assessment requires an investment in finance (equipment, space, trained personnel) and in resource (time needed for an individual assessment to take place). It is recommended on cost effective terms that individuals and organisations who provide fitness assessment to sedentary men or women re-appraise their service provision, since fitness assessment did not produce any unique physical activity or well-being changes

Exercise consultation

The practice of exercise consultation is a relatively new approach to changing the physical activity behaviour of sedentary adults. This research has demonstrated marginal positive effects in favour of exercise consultation. It is ideally suited to responding to the diverse needs of sedentary individuals. It is less costly than fitness assessment as it does not require the investment of equipment; personnel however,

still need to be trained to undertake an exercise consultation. It is also less costly in terms of the time required to carry out a full consultation. There is a large potential application for this intervention and a considerable resource of health professionals with knowledge of and generic skills in counselling.

Psychological well-being

The analysis of change in coping deficits revealed that the difference was not due to stage of change or to group intervention. As discussed above, the repeated measures analysis showed that there was no main effect for physical activity by intervention group and therefore it was unlikely that differences in psychological well-being by group intervention would have been found. The fact that no significant differences in coping assets and physical well-being were found is difficult to explain. The psychological well-being measurement tool has been recently devised and there is therefore little data to compare the findings from study three with other similar research studies. As the questionnaire has only six items for physical well-being (coping assets has 14 and coping deficits has 10), a bias may exist in the questionnaire construct prevailing against the physical well-being dimension, limiting its potential to demonstrate significant differences.

It could be added that the increase in physical activity across all groups did not result in a *deleterious* effect on psychological state. Steptoe noted that a number of well conducted studies failed to document differences between 'aerobic exercise and no treatment conditions' (21). A possible reason for the failure to document differences between the intervention groups may be due to the fact that subjects in this research were not assigned to structured exercise classes. Such subjects may not have had the benefit of social interaction from an exercise leader or from participation in an exercise classes. This line of argument however would lend weight to the presence of group and social involvement factors confounding the explanation of positive effects (21).

Supportive environments

It has been noted that physical activity status (as with fitness) is not an all or nothing phenomenon. Individuals can (and do) move between the adoption, maintenance and relapse phases in the "natural history" cycle of physical activity (61). The main effect for time and for the stage of change by time interaction gave clear indication of the downward trend in physical activity following positive initial adoption. Health related physical activity interventions have to recognise this division and provide some measure of on-going support so that individuals who are moving e.g., from adoption to maintenance, have recourse to this support (43). From a health

education/promotion perspective it is important to provide some measure of *choice* in the form of support to individuals who have moved from a relatively sedentary lifestyle to a more active one. It is suggested that exercise consultation could play a major role in sustaining the change after initial adoption of a more active lifestyle and this should tested in future research studies.

A period of some forty years has elapsed since Morris and colleagues (175) undertook their landmark study on the association between physical inactivity and coronary heart disease in male London transport workers. In a recent paper on the public health value of physical activity, Morris declared:

> 'Nothing less is required in developed countries than an epochal shift of behaviour to a more active style of living' p812 (176).

Part of this shift will be aided by well designed research which will be required to increase knowledge and understanding of the determinants of physically active lifestyles and a range of effective interventions. Whilst studies which look at the effectiveness of individual physical activity interventions with sedentary individuals must continue, it is recommended that such studies are fully cognisant of the larger social and environmental framework within which any intervention takes place.

Recommendations

The following recommendations are made for consideration in the field of health related physical activity:

Research

- In the area of physical activity research, there is a need for a simple yet valid mechanism or tool to identify individuals' activity status and their readiness to change. Given the initial positive findings from the adapted stages of change questionnaire, it is recommended that this questionnaire is further applied and examined.

- The development of a brief, valid and reliable monitoring tool to assess physical activity level remains a major challenge currently facing those in health promotion evaluation research. It is recommended that the adapted 7d recall questionnaire be used in research whereby the initial findings on its applicability, validity and reliability can be confirmed.

Individual interventions

Information

- In relation to adoption of physical activity, sedentary adults should be targeted prior to the giving of appropriate information; it is recommended that this process is combined with attempts to discover whether individuals can act effectively on this information.

Fitness assessment

- It is recommended on cost effective terms that individuals and organisations who provide fitness assessment to sedentary men or women, re-appraise their service provision, since fitness assessment did not produce any unique physical activity or well-being changes in the present research.

Exercise consultation

- This research has documented some evidence that in relation to sedentary individuals who have recently adopted a more physically active lifestyle, exercise consultation may be useful particularly in helping such people maintain positive change. Given the considerable resource of health professionals with knowledge of and generic skills in counselling, there is a large potential for application of this intervention.

Health promotion

- In recognising the division between adoption and maintenance in the "natural history" of physical activity, health professionals should consider providing some measure of on-going support. In this way individuals are more likely to maintain initial increases in physical activity. From a health promotion perspective it is important that this support includes some measure of *choice*.

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Appendix 1

Pilot

Health Questionnaire

Your answers to this questionnaire will remain confidential

This project is jointly supported by Department of Physical Education and Sports Science **University of Glasgow** and the Health Promotion Unit of **Ayrshire and Arran Health Board**

ORIGINAL COPY TIGHTLY BOUND

Questionnaire

Thank you for agreeing to take part in this pilot project

All information gathered in the questionnaire is confidential

Most of the questions require you to indicate Yes by a ✓ or No by a ✗
e.g., Are you on a diet? ☐ [✓/✗]

Some questions however require you to write in an answer
e.g., What sport(s) do you play ? _____, _____

Please answer all the questions and leave right hand columns blank

---

Personal History

1. Please tick the appropriate box — Male ☐ Female ☐

2. Enter your date of birth — Day..... Month..... Year.....

3. Do you have children? _____ [✓/✗]
   If yes, how many_____
   What are their ages? ____, ____, ____, ____,

4. Are you employed? _____ [✓/✗]
   What is your main job (include if it is part-time) ? _____
   How long have you been doing this job? _____

PERSONAL CHARACTERISTICS

6. What is your height [*without shoes*] __ft___ins or __.___ m

7. What is your weight[*without clothes*] __st___lbs or ____ kilos

MEDICAL INFORMATION

8. Have you or are you being treated for a heart condition or stroke?
   ☐ [✓/✗]

9. Do you suffer from joint disease or other complaint which prevents you from taking exercise?
   ☐ [✓/✗]

10. Do you take any medicine for any of the following

High blood pressure _____ [✓/✗] ☐

High cholesterol _____ [✓/✗] ☐

Hormone Replacement Therapy _____ [✓/✗] ☐

11. Is there any other reason you think you should not increase your physical activity?_____ [✓/✗] If yes, please state why: ☐

_____

CIGARETTE SMOKING

12. Do you smoke cigarettes now?

regularly ☐ [✓/✗]

occasionally (usually less than one per day) ☐ [✓/✗] (go to question 14)

no ☐ (Go to question 14)

13. On the average, about how many cigarettes do you smoke a day? ____ ☐

14. Do you smoke cigars or a pipe?

regularly ☐ [✓/✗]

occcasionally (usually less than once per day) ☐ [✓/✗]

no ☐

EATING HABITS

15. Are you currently on a diet? ____ [✓/✗]

16. Has a special diet ever been recommended to you ___ [✓/✗] ☐

If yes what was the reason_____

SPORT

17 Do you participate in sport? ____ [✓/✗]

18 Do you go to a sports hall/centre? _____ [✓/✗]

What activities do you do there? _____

_____

19 Do you do weight training (ie using weights)? _____ [✓/✗]

How often per week ?_____

How long does a session usually last ? _____

20 Do you go to a pool or gym aerobics/workout class _____ [✓/✗]

How often per week? _____

How long does a session usually last? _____

21 Do you swim regularly? _____ [✓/✗]

How often each week? _____

How long do you usually swim for ?_____

22 Do you dance regularly? _____ [✓/×]

What type of dancing is it? _____

How often do you usually dance each week? _____

How long does a session usually last _____ [minutes]

23. What sports eg individual and team games, do you play regularly ?

Sports	How often per week

PHYSICAL ACTIVITY

24 This question is about the amount of walking you do - that is walking to the shops, to a friend or perhaps for exercise

Do you walk regularly? _____ [✓/×] If no, go to question 25

		How often each week		
		1-3	4-6	daily
For walks of	0-10 mins			
For walks of	10-20 mins			
For walks of	over 20 mins			

25 Are you physically active in any other way? eg dig garden ☐ [✓/×]

If so, describe what you do_____

_____

EXERCISE

26. Do you run or jog regularly?_____ [✓/×]

How often each week? _____

How long do you usuallyrun/ jog for? _____

27. Do you cycle regularly? ____ [✓/×]

How often each week _____

How long do you usually cycle for? _____ [minutes]

28. Do you do any other outdoor sports? _____ [✓/×]

If yes, which one (s) _____ , _____

29. Would you say that your physical activity in sports and exercise etc has changed over the past:

[✓] tick the appropriate box

	got less	stayed the same	increased
1 month	☐	☐	☐
3 months	☐	☐	☐
6 months	☐	☐	☐

☐

GENERAL INFORMATION

30. What is your name _____

31. What is your address _____

_____

_____

Post code _____

Well done! - thank you for taking part

Please check that **all** the questions were answered

Seal up the questionnaire in the stamped envelope

- **Post it** or
- **Hand in** to staff at FOCUS Community Education Centre, Saltcoats

Appendix 2

EXERCISE AND HEALTH PROJECT
Pilot Study

EXERCISE INTERVIEW

Name_____ Date_____
Age_____ Ht_____Wt_____
SmokStatus_____

Exercise History/ previous interests and participation in exercise & sport
Which sports, if any, did you enjoy previously?
Would you like to try a new sport or exercise?

Being active:
Barriers
What do you think are the main barriers to you becoming more active?

Support
Do any of your family or friends exercise?

Facility provision
Do you know what is offered by the local authority leisure services?
Do you know of creche facilities?

Education

a) Principles of exercise

Do you understand the basic principles of exercise namely I, F and D? eg , how hard do you know you are exercising?

b) Mode of exercise

Do you know that different types of exercise improve different aspects of fitness? eg running for aerobic fitness, stretching for flexibility?

c) Routine for exercise

w/u,"circuit" followed by c/d

d) Activity and Health

How hard and often do you think you need to exercise to gain a health benefit?

Goals

What are your main reasons for taking up exercise? eg, weight gain/loss, meet new people, feel good/fitter/healthier

4 wks *12 wks*

Prescription

Information Pack

- hand out pack
- local authority provision; exercise guidelines

Exercise Log Sheets

- explain use and method of return

Return Visit

- explain method of recall
- look forward to seeing them

Thank participant for their time and assistance

INTERVIEWER_____

Appendix 3

EXERCISE DIARY

Exercise and Health project
Focus Centre, Saltcoats, April - July, 1992

NAME_____

Start Date of Diary_____

DAY	TYPE	How long - minutes	Total time
1			
2			
3			
4			
5			
6			
7			

DAY	TYPE	How long - minutes	Total time
8			
9			
10			
11			
12			
13			
14			

DAY	TYPE	How long - minutes	Total time
15			
16			
17			
18			
19			
20			
21			

DAY	TYPE	How long - minutes	Total time
22			
23			
24			
25			
26			
27			
28			

DAY	TYPE	How long - minutes	Total time
29			
30			
31			

You will receive another exercise diary for the last part of the duration of the study

Please use the stamped addressed envelope provided and return this diary by post

Thank you.

Exercise and Health Project
Healthy Heart Campaign
AYRSHIRE AND ARRAN HEALTH BOARD
Ayrshire Central Hospital
Irvine KA12 8SS
Tel 0294 74191 ext 4185/6

Appendix 4

Physical Activity - 7 Day Re-call

Exercise and Health Project
Focus Centre, Saltcoats, August 1992

NAME_____

Start Date of Diary_____

DAY	TYPE	How long - minutes	Total time
1			
2			
3			
4			
5			
6			
7			

Have you filled in your name?

Please use the stamped addressed envelope provided and return this diary by post to:

Exercise and Health Project
Healthy Heart Campaign
AYRSHIRE AND ARRAN HEALTH BOARD
Ayrshire Central Hospital
Irvine KA12 8SS
Tel 029474191 ext 4185/6

Appendix 5

Reliability of the adapted 7d recall questionnaire

A small scale study was carried out to assess the test, re-test reliability of the adapted form of the 7d recall leisure time physical activity questionnaire.

Subjects

A total of twenty one full time employed staff at a central stores distribution base of Forth Valley Health Board.

Procedures

Using an internal mail system, forty one staff were invited to take part in an 'exercise project' which involved the completion of two self administered questionnaires. Staff were assured that information contained in the questionnaires was for the sole use of the exercise project and that all information would remain confidential. A mail drop was used for staff to return the questionnaires at the depot. A free T-shirt was given to all staff who completed and returned the first questionnaire. Two weeks later staff received an identical questionnaire and were reminded that if they completed the second questionnaire, names from completed questionnaires would go forward to a prize draw of twenty five pounds.

Results

Twenty one questionnaires were returned for both the first and second questionnaires giving a response rate of fifty one per cent. Descriptive statistics are given in table 1

Table 1 Descriptive statistics for physical activity ($hr.wk^{-1}$) at test and two week re-test

	N	Mean	STDEV	Q1	Q3
Test	21	5.27	3.37	3.30	6.00
Re-test	21	5.35	3.27	2.88	6.75

Questionnaires with a short time frame, such as the 7d recall, re-administered after a short time period, measure a combination of short term stability of physical activity in addition to the questionnaire's reliability. A two sample t Test is given in table 2, revealed the overall stability of levels of physical activity over this time period.

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Table 2 Two sample t Test with 95% confidence intervals at test and re-test.

	N	Mean	STDEV	SE MEAN	T	p
Test	21	5.27	3.37	0.74	-0.08	0.94
Re- test	21	5.35	3.27	0.74		
95% confidence interval (-2.16, 1.99)						

The correlation coefficient between test and re-test at two week interval was 0.757 showing a significant relationship (critical value = 0.665, $p<0.001$;19 *df*).

Appendix 6

Appraisal of validation criteria for the adapted 7d recall of leisure time physical activity questionnaire†.

The purpose of this analysis is to examine two validation criteria, namely estimated $VO_{2\ max}$ and body mass index, with an adapted 7d recall questionnaire in a workplace adult population. Seventy five employees of North Ayrshire and Arran NHS Trust were invited to undertake a health related fitness assessment as part of a larger randomised controlled study.

A 7d recall leisure time physical activity questionnaire was completed in an interview setting and scored to provide each subject with a total in $hrs.wk^{-1}$. Thus each subject had a PA score, a body mass index (BMI) and an est.$VO_{2\ max}$ score at pre-test. Six months later subjects returned for post test and the same procedures were followed.

Three subjects (4%) were unable to complete the est.$VO_{2\ max}$ protocol at pre- test. Only thirty five of the seventy five (47%) re-appeared for post test. Correlation coefficients at baseline showed that there is a moderate negative relationship between validation variables in female subjects ($r=-0.45$; $p<0.001$), but no evidence of a significant relationship between physical activity and validation variables.

Table 3 shows gender specific paired t-tests between pre- and post test scores. This analysis revealed no significant difference in physical activity or body mass index at the 0.05 level. Males differed significantly ($p<0.05$) in est.$VO_{2\ max}$; the corresponding mean change in physical activity of ~50 minutes (0.83 hr) for males failed to reach significance
($p= 0.17$).

Table 3. Paired t tests for physical activity ($hr.wk^{-1}$) and est. VO_{2max} ($ml.kg^{-1}.min^{-1}$) and BMI($wt.ht^{-2}$) validation variables at pre- and post test.

		Mean	SD	t	p <
Physical	m (15)	0.83	3.26	0.98	ns
activity	f (40)	-0.02	2.88	-0.05	ns
Est. VO_{2max}	m (11)	3.36	5.59	2.00	0.05
	f (24)	0.87	4.89	0.88	ns
BMI	m (11)	-0.08	0.72	-0.35	ns
	f (29)	0.10	1.11	0.48	ns

Correlations between changes in physical activity from pre- to post test and changes in validation variables again showed no significant relationships.

The lack of association between physical activity and est.$VO_{2\,max}$ at pre- test and changes over time confirmed earlier research which suggested that the more moderate forms of physical activity, as picked up by the 7d recall questionnaire, failed to contribute to aerobic fitness. Aerobic power and body mass index determined largely by habitual forms of physical activity are therefore inappropriate validation measures for a 7d recall questionnaire.

[† This analysis formed the basis of a joint paper by the main researcher and Dr N Mutrie, which was accepted for presentation at the British Association for Sports and Exercise Sciences' annual conference, August 1995.]

Appendix 7

Exercise and Health Project

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE [PARQ]*

This questionnaire is designed to help you help yourself. Many health benefits are associated with regular exercise, and the completion of the PARQ is a sensible first step to take if you are planning to increase the amount of physical activity in your life

For most people physical activity should not pose any problem or hazard. PARQ has been designed to identify the small number for whom physical activity might be inappropriate or those who should seek medical advice concerning the type of activity most suitable for them.

Common sense is your best guide in answering these few questions. Please read them carefully and tick the Yes ☐ box or No ☐ box opposite the question if it applies to you

Yes	No	
☐	☐	1. Has your doctor ever said you have heart trouble?
☐	☐	2. Do you frequently have pains in your heart and chest?
☐	☐	3. Do you often feel faint or have spells of severe dizziness
☐	☐	4. Has your doctor ever said your blood pressure was too high?
☐	☐	5. Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise, or might be made worse by exercise?
☐	☐	6. Is there a good physical reason not mentioned here why you should not follow an activity programme even if you wanted to?
☐	☐	7. Are you over age 65 and not accustomed to regular, moderately vigorous exercise?

Name: _____

Date: _____

* Adapted from PAR-Q Validation Report. British Columbia Department of Health, June 1975 (Modified version) in *Guidelines for Exercise Testing and Prescription* American College of Sports Medicine 4th Edition Lea & Febiger 1991

Appendix 8

Exercise and Health Project
Focus, Saltcoats, May - August 1992

Fitness Assessment Profile

Name Age M/F

Occupation Smoking status

Blood Pressure
Systolic Diastolic HR

PARQ questionnaire

Body Composition
Ht Wt BMI (Wt/Ht²) Waist:Hip Ratio:

Skinfolds
Bicep Tricep Subs'r S'iliac
%Body Fat
Comment

Cardiorespiratory Endurance

Level	1	2	3	Pred. max VO_2
Workload (Watts)				
Heart rate (/min)				

Comment

Flexibility
Sit & Reach , , , cms
Comment

Local Muscular Endurance
Sit-ups Press-ups
Comment

Physical activity advice

Goals

Date Sgn

Appendix 9

Free fitness assessment and exercise consultation!

Exercise and Health Research Project

Glasgow University in conjunction with North Ayrshire and Arran NHS Trust is carrying out a survey of lifestyles based on exercise. The survey in particular wants to find out how physically active you are in your **leisure time.**

This project will give the opportunity for a number of staff to voluntarily have either a fitness assessment or exercise consultation carried out during working hours.

All information will be treated in strict **confidence.**

Opportunities for a fitness assessment or exercise consultation will be available from **August 1993.**

Please complete the sheet overleaf and use the addressed envelope via the internal mailing system.

Thank you for taking part in this survey.

Christopher Loughlan
Researcher, University of Glasgow
Exercise Adviser, Health Promotion Unit, Ayrshire and Arran Health Board

BE ACTIVE IN AYRSHIRE

Exercise and Health Project

In this project "regular physical activity" relates to:

exercise - weight training, aerobics... for 2-3 times per week

sport - golf, hockey, football... for 2-3 times per week

physical activity - walking, gardening, for at least 15 mins/4-5 times per week

Name _____ Sex M/F

Occupation _____ Age _____

Do you consider yourself to be regularly physically active now?

Yes ☐ No ☐ tick one box

If no, were you regularly physically active,

3 months ago Yes ☐ No ☐ tick one box

6 months ago Yes ☐ No ☐ tick one box

Please read through all categories and tick ONE box against the category which best describes how physically active you have been over the last six months in your ***leisure time***

I am not regularly physically active and do not intend to be so in the next 6 months ☐

I am not regularly physically active but am thinking about starting to do so in the next 6 months ☐

I do a little regular physical activity but not enough to meet the examples at the top of the page ☐

I am regularly physically active but only began in the last 6 months ☐

I am regularly physically active and have been doing so for longer than 6 months ☐

If you feel that you are unable to tick any one box describe your physical activity state here

All information relating to individuals in the project is **strictly confidential**.
Please return through internal mailing system using addressed envelope to
C Loughlan, Health Promotion Unit, Ayrshire Central Hospital

Thank you

Appendix 10

Fitness Assessment Profile

Name **D.O.B.**

Occupation **Dept/Ward**

Address **Smoker Y/N? N°**

PARQ ok?_____

Body Compostion

Ht Wt [BMI]

Comment *It is important to maintain your body weight within an acceptable range. Being overweight restricts the amount and type of physical activity you can enjoy.*

Aerobic Power

	1	2	3	VO_2Max
Workload (watts)				
Heart rate/min				

Comment *Aerobic fitness is generally agreed to give you a number of important health benefits. People who are aerobically fit (have stamina), also feel better and have more energy in their day to day lives.*

Flexibility

Sit and reach , , , cms

Comment *Flexibility is important: being able to bend, twist and turn in very important for day to day tasks. It also helps to reduce 'wear and tear' on muscles and joints*

Strength

[sit ups/press-ups]

Comment *Keeping your body fit by maintaining strength fitness is vital for general day to day tasks of lifting, pulling and pushing*

Goals

immediate intermediate(4/6 wks) long (6months)

Physical activity advice

date sgd

Appendix 11

EXERCISE PROJECT
Exercise Consultation

Name _____ **DOB** ___/___/___

Occupation _____ Tel ext _____

Dept/Unit _____

"Exercise" history/ previous interests and participation in exercise & sport
Ask staff to think about any physical activity (exercise and sport) they do/have done?

Prompt
for regular walking, DIY, gardening etc.

Balance
Ask staff to think of possible gains and losses when becoming more physically active

Gains	Losses
_____	_____
_____	_____
_____	_____

Prompt
if gains<<losses explore realistic inclusions

Barriers
Ask staff to think of the main barriers to becoming more active?

_____
_____
_____

Prompt
time
money
illness/injury
holiday
facility
weather

Support
Any family, friends or work colleagues who are at the same stage?

Goals
What are your main goals for taking up exercise/being more active?

_____
_____
_____

Prompt
lose/gain weight
social
look/feel better

Assist staff in setting

Immediate	Intermediate[4-6weeks]	Long [6 months]
_____	_____	_____
_____	_____	_____
_____	_____	_____

Staff complete "Goals Card" copy from goals card

Information Pack
- hand out leaflet
- local authority provision;

Ht _____ **Wt** _____ [BMI _____]

Smoker? Y/N If yes, No per day

Monitor progress 'Physical Activity 7 day recall'
- explain use and method of return
- at 4wks free T-Shirt (3months & final follow up at 6months)

Return Visit
- contacted at 5 and half months for recall
- look forward to seeing them

Thank participant for their time and involvement

INTERVIEWER _____ Date ___/___/____

Appendix 12

Leisure Time Physical Activity
7 Day Recall

The physical activity 7day recall is a relatively simple and quick method of measuring the amount of physical activity you've done **over the last week in your leisure time.** Please read the following pointers which will help you complete the form.

example,

Name: *Sheila Smith*

Day	morning	afternoon	evening
Sunday	*walked to shops 20 mins* *walked dog 20 mins* 40 mins	*went to swimming pool* 20 mins	 

Recalling your activity

To help you remember your activites over the previous week, think of what you did on each day at each time block e.g. in the above, ask yourself "what did I do on Sunday morning, then the afternoon, then finally in the evening".

Accuracy

In the example above, the subject recalled accurately that she swam for about 20 mins though she was actually in the pool for 45 minutes. So put down the **actual** amount you were physically active.

To help you recall think of the time in blocks of 10 minutes. Put down all your physical activity which lasted for **10 or more minutes.**

What if the time period is, say, 14 minutes then use the following guide

2,3,4,5 mins round down to previous multiple of ten (e.g.14 mins = 10 mins)

6,7,8,9 mins round up to next mutiple of ten, (e.g. 17 mins = 20 mins)

Activity

Think of the following 4 headings:

walking walking to the shops, to work or walking a dog

exercise running, cycling, dancing and classes e.g., aquatrim, aerobics, step, etc

sport sports which require at least a moderate amount of physical activity e.g., golf, football, hockey
(do not include sports that require little physical activity, e.g. snooker)

being active gardening, most DIY, household work that requires a moderate amount of physical activity
(do not include light activities e.g. dusting, dish washing, 'hoovering', ironing etc)

Totals

Add the total amount of minutes physical activity for each morning, afternoon and evening timeblock and place in the ☐ provided.

p.s make sure that you fill in your name

Leisure Time Physical Activity
7 day recall

NAME Dept/Unit

day	morning	afternoon	evening
1 Monday			
2 Tuesday			
3 Wed'sday			
4 Thursday			
5 Friday			
6 Saturday			
7 Sunday			

Appendix 13

Name _____ F.A/Ex.C. * *delete

Date _____

Below is a list of words and phrases that describe feelings that people have. Please read **each one** carefully, then f **in one circle** to the right of the word or phrase to indicate the answer which best describes the extent to which you have had this feeling during the past week including today.

The numbers refer to these phrases
0 = not at all
1 = a little
2 = moderately
3 = quite a lot
4 = extremely

Marking directions
use a pencil
correct mark ⓪①②③④
erase cleanly

During the last week including today to what extent have you been feeling:

	not at all	a little	moderately	quite a lot	extremely
1. self confident	⓪	①	②	③	④
2. easily irritated	⓪	①	②	③	④
3. enthusiastic	⓪	①	②	③	④
4. disappointed with yourself	⓪	①	②	③	④
5. uplifted	⓪	①	②	③	④
6. calm	⓪	①	②	③	④
7. bored	⓪	①	②	③	④
8. refreshed	⓪	①	②	③	④
9. drained	⓪	①	②	③	④
10. easily upset	⓪	①	②	③	④
11. proud of yourself	⓪	①	②	③	④
12. elated	⓪	①	②	③	④
13. distressed	⓪	①	②	③	④
14. strong emotionally	⓪	①	②	③	④
15. invigorated	⓪	①	②	③	④
16. bothered	⓪	①	②	③	④

Think about what you have done during the last week including today. To what extent have you been feeling that you are:

17. coping	⓪	①	②	③	④
18. achieving something	⓪	①	②	③	④
19. overwhelmed	⓪	①	②	③	④
20. overcoming difficulties	⓪	①	②	③	④
21. getting closer to your goals	⓪	①	②	③	④
22. defeated	⓪	①	②	③	④
23. well organised	⓪	①	②	③	④
24. under too much pressure	⓪	①	②	③	④
25. competent	⓪	①	②	③	④
26. getting things under control	⓪	①	②	③	④

Think about the way your body has felt during the last week including today. To what extent have you been feelir physically:

27. stiff	⓪	①	②	③	④
28. healthy	⓪	①	②	③	④
29. flabby	⓪	①	②	③	④
30. strong	⓪	①	②	③	④
31. supple	⓪	①	②	③	④
32. clumsy	⓪	①	②	③	④
33. fit	⓪	①	②	③	④
34. run down	⓪	①	②	③	④
35. attractive	⓪	①	②	③	④
36. well	⓪	①	②	③	④

Appendix 14

Customer Satisfaction

Exercise Consultation

In order to ensure and improve the quality of service provision to NHS staff it would be appreciated if you would complete and return this evaluation.

1. Information to you in the invitation was

Inadequate					most adequate
0	1	2	3	4	5

2. The exercise consultation room is

Unacceptable					most acceptable
0	1	2	3	4	5

3. The manner of the exercise specialist was

Unhelpful					most helpful
0	1	2	3	4	5

4. The format of the consultation was explained to you

Badly					well
0	1	2	3	4	5

5. Feedback from the consultation was explained to you

Badly					well
0	1	2	3	4	5

6. The time spent on the consultation was

too short____ about right____ too long_____

7. As a result of the consultation my intention to begin/increase physical activity is

Decreased		unchanged			increased greatly
0	1	2	3	4	5

8. Please make any other comments on this service.....

THANK YOU FOR COMPLETING THIS EVALUATION FORM

Please return to: Exercise Adviser, Health Promotion Unit, Ayrshire Central Hospital, Irvine [tel 0294 74191 ext 4185]

Customer Satisfaction

Fitness Assessment

In order to ensure and improve the quality of service provision to NHS staff it would be appreciated if you would complete and return this evaluation.

1. Information to you in the invitation was

Inadequate					most adequate
0	1	2	3	4	5

2. The exercise centre room is

Unaccepatble					most acceptable
0	1	2	3	4	5

3. The manner of the fitness assessor was

Unhelpful					most helpful
0	1	2	3	4	5

4. The format of the assessment was explained to you

Badly					well
0	1	2	3	4	5

5. Feedback from the assessment was explained to you

Badly					well
0	1	2	3	4	5

6. Written feedback of your results is

Unhelpful					most helpful
0	1	2	3	4	5

7. The time spent on the *assessment* side was

too short____ about right____ too long_____

8. The time spent discussing your *results* was

too short____ about right____ too long_____

9. As a result of the assessment my intention to begin/increase physical activity is

Decreased		unchanged			increased greatly
0	1	2	3	4	5

10. Please make any other comments on this service.....

THANK YOU FOR COMPLETING THIS EVALUATION FORM

Please return to: Exercise Adviser, Health Promotion Unit, Ayrshire Central Hospital, Irvine [tel 0294 74191 ext 4185]

Appendix 15

Exercise and Health Project

Crosshouse Hospital, Kilmarnock

Training of Research Assistants

Training Day
Wednesday 6 April 1994 9.30 a.m. - 4.00 p.m.

Provisional

9.30 - 9.45	Introduction to research project	cl
9.45 - 10.25	"Promoting Health Related Physical Activity" [The hastle free guide to exercise	[sb] HEBS]
10.25 - 10.40	Explanation of protocol	cl
10.40 - 11.00	Stretch break	
11.00 - 11.45	Exercise Consultation pro-forma	nm
11.45 - 12.15	Role Play (ExC)	nm/cl
12.15 - 12.30	Information only (controls)	cl
12.30 - 1.30	LUNCH	
1.30 - 2.30	Fitness assessment - profile	cl
2.30 - 3.30	Measures - PARQ - 7 day recall - well-being scale - Customer satisfaction - Expectation effects	cl
3.30 - 3.45	Controls	cl
3.45 - 4.00	Summary	cl

Exercise Project

Crosshouse Hospital, Kilmarnock

Protocol

1. Introduce yourself

2. Give brief background information on project;
   - emphasise confidentiality of project and its findings;
   - follow-up (at 4 wks 3 & 6 mnths) is an integral part of the study

3. Invite questions from staff

4. Explain *random* selection of staff to:
   fitness assessment/exercise consultation/information group

5. Explain format of intervention (as appropriate)

Exercise Consultation	**Fitness Assessment**	**Information Group**
# well-being scale	# well-being scale	# well-being scale
# 7 day LTPA recall	# 7 day LTPA recall	# 7 day LTPA recall
# PARQ	# PARQ	
# pro-forma	# profile	
# booklet/info	# booklet/info	# booklet/info
# expectation effect	# expectation effect	# expectation effect

6. Thank staff for time and involvement; remind them of follow-up at 4 wks (free T-shirt), 3 months and finally at 6 months.

Appendix 16

BE ACTIVE IN AYRSHIRE

Exercise for Health Project Newsletter
Ayrshire Central Hospital

Hello ,

You may not be aware that you are now half way through the exercise project. I hope that you are managing to keep more active. I hope also that you received your free T-shirt by completing and returning the 7 day recall questionnaire.

If not, please contact me at the hospital on ext 4185/6

Benefits of being active

* more relaxed
* sleep better
* feel better
* more energetic

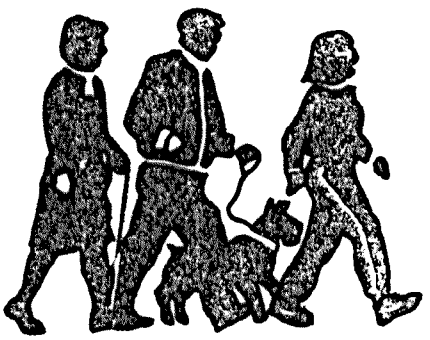
These benefits can come with regular physical activity it doesn't have to be a high intensity exercise class or vigorous sport. *You* choose what type of activity you enjoy doing.

Being Active

Studies now show that regular, low intensity physical activity is of benefit to you and that each little bit of physical activity adds up.

This is good news for those of us who have busy schedules and find it difficult to fit exercise or activity in. For example each little bit of walking adds up to give us a benefit - we can all manage a few short walks throughout the day.

Make a point to fit them into the day



Leisure Time 7 Day recall

I would greatly appreciate it if you could complete another 7day activity recall questionnaire - this would give me information of how you are doing at the half way stage.

Some tips now follow to remind you how to complete the form...

Tips

Tips for completing the 7 day activity recall questionnaire:

TYPE: moderate/vigorous e.g.

Walking to/from shops
not "shopping"

Housework moderate activities
not light activities
such as dishwashing
dusting or 'hoovering'

Sports moderate activities
not billiards or snooker

AMOUNT
state how long you were actual active for e.g.

I hour in swimming pool but
20 minutes swimming
= 20 mins activity

Invitation

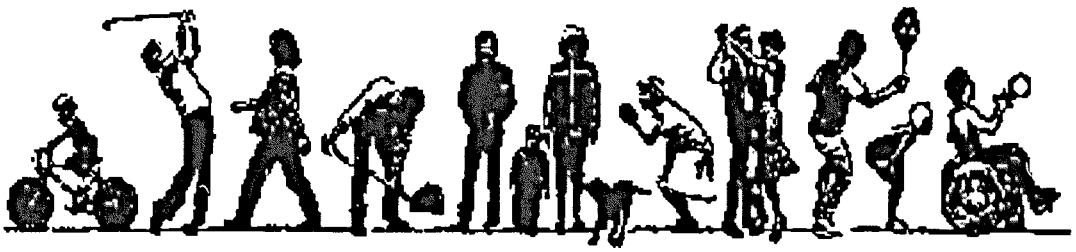
All project participants will receive an invitation to return i the new year for follow-up. A letter will go out in mid Januar with the dates set for mid to lat February 1994.

As I finish off this newsletter, I am aware that there are only 1(or so shopping hours left till Christmas....
See you in the New Year!

Best wishes

Christopher Loughlan
Project Leader

Appendix 17



BE ACTIVE IN AYRSHIRE

Exercise and Health Project

run in conjunction with

University of Glasgow

The project is supported by the Lottery Fund,
North Ayrshire and Arran NHS Trust
and
Ayrshire + Arran Community Health Care NHS Trust

Introduction

Glasgow University in conjunction with the North Ayrshire and Arran NHS Trust and the Community Health Care NHS Trust, is carrying out a survey of lifestyles focusing on exercise. The survey in particular wants to find out how physically active you are in your **leisure time.**

This project will give the opportunity for a number of staff to **voluntarily** have either a fitness assessment or exercise consultation carried out during working hours.

All information will be treated in strict **confidence.**

Opportunities for a fitness assessment or exercise consultation will be available from **April 1994.**

Please complete both sides of the the sheet opposite. You can return it to your line manager **or** simply use the internal mailing system as appropriate.

Thank you for taking part in this survey.

Christopher Loughlan
Researcher, University of Glasgow

Health Promotion Unit,
Ayrshire + Arran Community Health Care NHS Trust

Exercise and Health Project

Personal details

Name _____

Sex M ☐ F ☐ tick one box

Age tick one box

- 16 -19 ☐
- 20 -39 ☐
- 40 -59 ☐
- 60 and over ☐

Occupational category tick one box

- Domestic and Ancillary ☐
- Administrative and Clerical ☐
- Para-medical ☐
- Nursing ☐
- Medical ☐
- Other _____

Shift tick one box

- day ☐
- backshift ☐
- night ☐
- rotating ☐
- morning only ☐
- afternoon only ☐
- other _____

Ward/Department _____

Tel ext _____

All information relating to individual staff in the project is **strictly confidential**

P.T.O

Exercise and Health Project

Regular physical activity in your leisure time relates to:

exercise e.g., weight training, aerobics... for 2-3 times per week; hill-walking at least one day every week
or
sport e.g., golf, hockey, football... for 2-3 times per week
or
general activity e.g., walking, gardening, for at least 30 mins / 4-5 times per week

Leisure time physical activity

Do you consider yourself to be regularly physically active now?

Yes ☐ No ☐ tick one box

If no, were you regularly physically active,

3 months ago Yes ☐ No ☐ tick one box

6 months ago Yes ☐ No ☐ tick one box

Leisure time physical activity

*Please read through all categories and tick **ONE** box against the category which best describes how physically active you have been over the last six months in your **leisure time***

I am not regularly physically active and do not intend to be so in the next 6 months ☐

I am not regularly physically active but am thinking about starting to do so in the next 6 months ☐

I do some physical activity but not enough to meet the description at the top of the page ☐

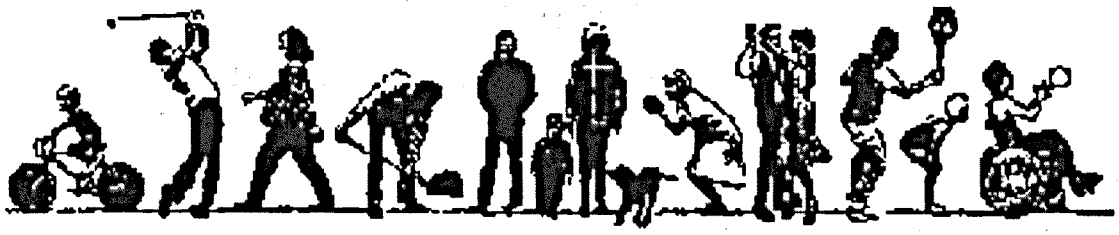
I am regularly physically active but only began in the last 6 months ☐

I am regularly physically active and have been doing so for longer than 6 months ☐

tick one box

All information relating to individual staff in the project is **strictly confidential**
Please return to line manager or through internal mailing system using addressed envelope to
C Loughlan, Health Promotion Unit, Ayrshire Central Hospital
Thank you

Appendix 18



BE ACTIVE IN AYRSHIRE

Exercise Project
run by
Glasgow University

7 Day recall of physical activity

Please complete the enclosed 7 Day recall questionnaire
- remember to mark in the preferred size for your free T-shirt

Thank you

Christopher Loughlan
Researcher
University of Glasgow

7 Day Recall
Leisure Time Physical Activity

The 7day recall is a relatively simple and quick method of measuring the amount of physical activity you've done **over the last week in your leisure time.**

example,
Name: *Sheila Smith*

Day	morning	afternoon	evening
Sunday	*walked to shops 20 mins* *walked dog 20 mins* 40 mins	*went to swimming pool* 20 mins	

Recalling your activity

To help you remember your activites over the previous week, think of what you did on each day at each time block e.g. in the above, ask yourself what did I do on Sunday morning, then the afternoon, then finally in the evening.

Accuracy

In the example above, Shiela recalled accurately that she swam for about 20 mins though she was actually in the pool for 45 minutes.

Put down the **actual** amount you were physically active.

Duration

To help you recall think of the time in blocks of 10 minutes. Put down all your physical activity which lasted for **10 or more minutes.**

Activity

The chart on the opposite page gives you some guidance as to what activities you should include in the recall

Totals

You may have been active on two different occasions in any one session

Add the total minutes of physical activity for each morning, afternoon and evening timeblock and place in the ☐ provided.

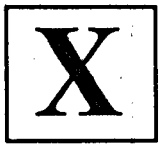
Complimentary T-shirt

T Shirt size? S ☐ M ☐ L ☐ tick box

p.s. make sure that your name is at the top of the returned questionnaire on p.4

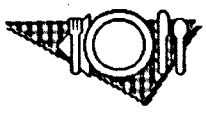
7 Day Recall LEISURE TIME PHYSICAL ACTIVITY

WHICH ACTIVITIES? - This chart is designed to help you fill out the 7 day recall



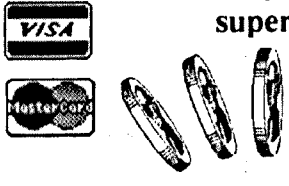
DO NOT INCLUDE LIGHT ACTIVITIES

- **Kitchen** e.g. baking, washing dishes, preparing food.



- **Household** e.g. embroidery, sewing/mending, dusting/polishing, hoovering, waxing/polishing car, knitting, painting.

- **Shopping** e.g. in and around shops, supermarket



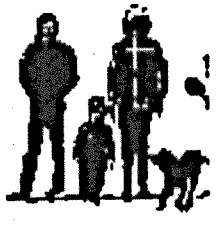
- **Sport/leisure.** e.g. snooker, billiards, darts, fishing, playing a musical instrument.

INCLUDE MODERATE TO HARD ACTIVITIES

- **Exercise** e.g. exercise classes, exercise at home dancing

- **Household** e.g. DIY - sawing, sanding, papering, scraping, scrubbing floors

- **Walking** e.g. walking to shops, walking your dog, walking to work.



- **Outdoor Activities** e.g. gardening. washing car,

- **Sport** e.g. netball, badminton, football, golf, swimming.

7 day recall Leisure Time Physical Activity

NAME Dept/Ward

day	morning	afternoon	evening
1 Monday			
2 Tuesday			
3 Wed'sday			
4 Thursday			
5 Friday			
6 Saturday			
7 Sunday			

Lastly !

Is the above level of physical activity representative of a normal week Y/N? (delete)

If no. what are you likely to do?.....hours.....mins

Appendix 19

Exercise consultation group

1. Do you think an exercise consultation will alter your:

	not at all	not really	unchanged	a little	greatly	
a) intention to be more active	☐	☐	☐	☐	☐	*tick one box*
b) actual physical activity	☐	☐	☐	☐	☐	*tick one box*

Fitness assessment group

1. Do you think a fitness assessment will alter your:

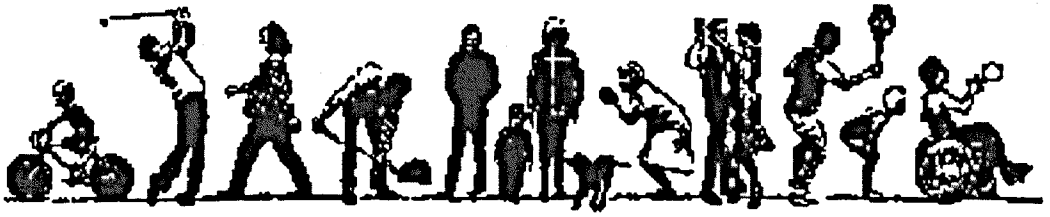
	not at all	not really	unchanged	a little	greatly	
a) intention to be more active	☐	☐	☐	☐	☐	*tick one box*
b) actual physical activity	☐	☐	☐	☐	☐	*tick one box*

Information group

1. Do you think information on physical activity will alter your:

	not at all	not really	unchanged	a little	greatly	
a) intention to be more active	☐	☐	☐	☐	☐	*tick one box*
b) actual physical activity	☐	☐	☐	☐	☐	*tick one box*

Appendix 20



BE ACTIVE IN AYRSHIRE

Exercise and Health Project 1994
Crosshouse Hospital

Hello

You are now half way through the project. Thank you for returning the 7day recall at the 4 week interval. If you did not receive a complimentary T-shirt please give Norma a call at Ayrshire Central, on ext 3729

Good news

A recent report by an American research organisation has shown that there are health benefits in becoming more physically active on a daily basis - *exercise doesn't have to be that strenuous*. This message has been taken up by the Health Education Board for Scotland. You may have already heard of 'active living'

Active Living
- be active in your own way
- add small amounts of physical activity to your daily schedule
- try to maintain these changes

£100 prize draw!

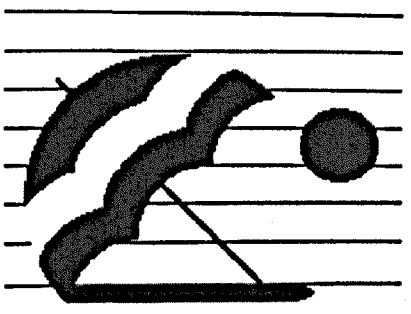
There are three prize draws available. Simply return the 7 day recall questionnaire with your name and get entered for the draw:

1st prize **£50**
2nd prize **£30**
3rd prize **£20**

[Note prizewinners will be published in the next issue of the Pulse]

The money will be in the form of vouchers - prizewinners will be able to buy exercise/sports goods to the value of the prize

Thanks to the Community Trust for sponsorship of the prizes



SUMMER

On behalf of the project team may I wish you a good summer break

Follow-up

We will call everyone back for the final 6 month follow-up. We would like to see everyone. Remember that no one actually "fails" in this project. Even though you might think that you have done less physical activity it is important that we see you for the purposes of the project.

We will be in touch by mid September

Best wishes

Chris Loughlan

Chris Loughlan
Exercise and Health Project
Ayrshire Central Hospital
ext 3468